PATTERN OF RECOVERY IN CHILDREN WITH STUTTERING

Project Report

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A Project funded by the AIISH Research fund (2010-11)

ALL INDIA INSTITUTE OF SPEECH AND HEARING

MANASAGANGOTHRI

MYSORE – 570 006

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Sanction No. SH/coordn/ARF/3.54/2010-11

Total Fund: 4.71 Lakhs

Duration: 18 months

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Acknowledgements

The Principal investigator and the co-investigators of this project extend their sincere gratitude to the Director, All India Institute of Speech and Hearing for sanctioning the project and all the cooperation extended till its completion. The investigators express sincere thanks to Ms. Aishwarya Anand, Reasearch officer in the project, who has put in lot of effort in completing the project in time. Thanks are very much due to Ms. Sahana V. for all the help rendered during the completion of the project report.

The investigators thank Ms. M.S. Vasanthalakshmi, Lecturer in Biostatics, and Mr. Santhosh, Lecturer in Statistics, Dept. of Speech-Language Pathology for all the help rendered towards statistical analysis of the project data. Thanks are also very much due to all the clients and their caregivers who participated in the study, who took time off their valuable schedule to provide the necessary information pertaining to the project.

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Introduction

Stuttering, or stammering as it is also referred to, is a developmental speech disorder, which usually appears in children between the ages of 3 and 8 years. The mean ages of onset reported range from 28 months (Yairi, 1983) to 46 months (Darley, 1955). Stuttering is characterized by involuntary syllable repetitions, syllable prolongations, or interruptions (blocks) in the smooth flow of speech. There may sometimes be difficulty in differentiating very young children who definitely stutter from those who show the disfluencies often seen in infancy as a normal stage of speech development. However, the two are distinct. The overall frequency of disfluency, the proportion and duration of disfluency types, and the associated behaviors not directly related to speech such as eye, head, and body movements, can help to distinguish between the two.

More often than not stuttering remits itself before puberty, but it can persist into adult life. It is considered that an individual is at high risk for continuing stuttering when he or she exhibits stuttering, stuttered – like or within word disfluencies at relatively predictable parts of their speech; when these dysfluencies persist over sufficiently long periods of time (no matter how cyclical their appearance may be); and when these dysfluencies are consistently associated with certain sounds, syllables, words, or speaking situations. A person may be safely considered to be a person who stutters or at high risk for becoming one when we know, with a relatively high degree of certainty, that a person will stutter when he talks (prediction), when he continues to do so for sometime (persist), and when his disfluencies regularly occur in association with observable events (consistent).

A person has high probability of recovering from stuttering if his or her frequency or type of within word dysfluency has been highly variable over a three- to six month period of time or longer, exhibits little predictability of speech fluency (may or not be disfluent when he or she talks), and appears unrelated to other events or stimuli. Of course, any person who, at one point appears at no or low risk for stuttering can become at moderate to high risk for the same, but the probability is low that such a change will take place. There are some risk factors suggested in the literature for predicting recovery or to make decisions regarding intervention such as the presence of family history, chronicity and severity of the problem, associated phonological and

language delays or defects, consistency of the problem, child's and/or parental concern etc. Other variables- for example, concomitant speech language problems (eg; Conture, Louko, & Edward, 1993), attention deficits (eg; Riley and Riley, 1988), and temperamental variables (Guitar, 1997), - can also play a role in determining whether a person is highly likely to continue stuttering.

Clinicians are often apprehensive in counseling the parents regarding the need for intervention for young children with stuttering in terms of duration of treatment required, outcome expected, the techniques which facilitate recovery etc. This is more so with those who adhere to the Wendell Johnson's Diagnosogenic Theory. This is a serious problem when the current emphasis is more on early identification and intervention. Stuttering has serious impact on the individual's personal (self-esteem), psychological, social, vocational and interpersonal relations. The impact of stuttering problem on the young minds to live with it, could be quite handicapping emotionally, socially, educationally and vocationally as reported by many persons with stuttering. However, early identification and treating children close to the onset of stuttering is increasingly emphasized by many authors for the following reasons:

(1) It is easy, less time consuming and more long lasting (i.e., approximately 1-3 months or 20 hours for children (Starkweather & Gottwald, 1986) to one to several months/years or 140 hours for adults (Van Riper, 1973; Webster, 1974).

(2) Reported rates of success is higher (>90%) compared to that for adults (50-75%) (Franken, 1988; Starkweather, Gottwald, & Halfond, 1990; Webster, 1974).

(3) Relapse rates for treated adults are reported to be around 50% (Franken, 1988); whereas for children it is close to zero (Starweather, Gottwald & Halfond, 1990).

(4) Adults who are treated are reported to have carefully monitored speech (Boberg & Kully, 1994) and diminished quality of speech (Franken, 1988) or may have residual stuttering behaviors (Prins, 1984) while the treated children are reported to be no different from their non-stuttering peers (Starweather, Gottwald & Halfond, 1990).

(5) Although it is reported that many children with stuttering spontaneously recover, nearly 20% would continue to stutter if not treated and it is not a small number when 1% of the total adult population who continue to stutter if not treated is considered.

Determining with reasonable accuracy the proportion of children who indeed recover of their own accord and those who persist in stuttering and isolating factors that govern or influence persistency and remission are key objectives in the overall research efforts concerning the nature of stuttering. These objectives have immense, clinical, financial and ethical consequences. This issue however, has been subject of considerable debate by several investigators (Ingham, 1983; Martin & Lindamood, 1986; Ramilyz, 1993; Young, 1975) who, citing concerns about past research, have concluded that the level of spontaneous remission is considerably lower than 50% or even 40%. On the other hand Yairi (1997) had argued that such low estimates overlook essential epidemiological factors that influence persistency and remission-particularly age, sex and time elapsed from onset of stuttering. For example, because recovery can take place at a very early age and within a short period after onset, an appreciable number of stuttering incidence and recovery cases go unreported (Cox, 1996), making it impossible to capture most of the phenomenon of unaided recovery. Therefore, for precise estimate of the true level of persistent and recovered stuttering, longitudinal studies must be begun from close to the onset of the disorder.

From a clinical standpoint, reasonably reliable estimates of the probability and timing of spontaneous recovery, or risk of developing persistent stuttering, should significantly affect overall intervention strategies. Individual prognosis from each child regarding the risk for chronic stuttering and choosing between a waiting period or immediate treatment can become scientifically based. Treatment efficacy studies for early childhood stuttering would be expected to become more accurate by better isolating the true treatment effects from spontaneous recovery. Theoretically, information about the nature of the difference between persistent and recovered stuttering is contradictory. That is, although arguments in favor of environmental factors such as parental intervention have been entertained (Ingham 1983, Zebrowski 1997), a recent study by Ambrose, Cox and Yairi (1997) have provided evidence suggesting that the two subsets of children who stutter, those who persist and those who recover, have different genetic

liabilities for stuttering. Such unrecognized heterogeneity may explain many previous ambiguous or contradictory results regarding characteristics of speech, physiology, home environment, and other parameters of young children who stutter. Separating those children who will eventually persist, from those who will recover from stuttering will increase precision in experiments with various aspects of the disorders in childhood and provide data basically for modifying the traditional viewing of stuttering as a unitary disorder.

The studies with respect to understanding recovery in CWS are scanty in general and more so with regard to the Indian context, with its unique cultural and linguistic environment. Therefore, the present project was undertaken with the following objectives.

Objectives:

- Determining with reasonable accuracy the proportion of children who recover of their own accord (spontaneous recovery) and those who do with treatment and those who persist or relapse after treatment

- To determine the treatment and other factors contributing to recovery/relapse in CWS

Review of literature

Fluency is referred to as "A barometer for the entire speech system (with its) limits apparently set by adequacy of performance of the other dimensions of speech" (Perkins, 1977). According to Sarkweather (1987), fluency is the effortless production of long continuous utterances at a rapid rate. The three important elements of fluency include continuity, ease and rate.

As the children mature, their speech becomes increasingly fluent. Also, children learn to deal with lack of fluency in more sophisticated ways. There is increasing control over the movements of the vocal tract. Children become more fluent as there is increase in their syntactic, semantic, phonologic and pragmatic knowledge. However, people with whom children communicate- their parents, siblings, peers, teachers, place demands on their speech. Fluency is disrupted by pauses, hesitations and repetitions. Disfluencies are found in speech of everyone especially when the person is uncertain of what he is saying and more so in case of children. A few of the important factors which influence fluency are language maturity, environmental stress, physical conditions, grammatical complexity, etc.

Physiological factors: Fluency of speech is directly related to the characteristics present in the mechanism of speech production. The structures which move for speech production are relatively small and light weight when compared to the other movements in the body- largest and heaviest being the mandible and the smallest and the lightest are the vocal folds. A number of factors like the size and mass of the structures influence fluency. Distances travelled by the movements of those structures are small. All these i.e, small size, mass, distance and muscle lengths of the vocal tract suggest that production of speech requires relatively les effort. For the speech to be fluent, a coordination between such movements is necessary. Both spatial and timing coordination of movements contribute to fluency. A set of body parts, muscles and neural mechanism that participates is called coordinative structure (Fowler & Turvey, 1980).

Relatively little is known about the fluency characteristics of normal children and their response to fluency disrupting stimuli. Almost nothing is known about the changes in fluency throughout the life cycle, particularly for older speakers (Manning, Dailey & Wallace, 1984;

Manning & Shirkey, 1981). Furthermore, few data have been accumulated about the fluency characteristics as a function of variables such as gender, race, culture and socio- economic level. Language and speech production is a complex task; it takes many years of experience to do it well; especially under conditions of stress. The term fluency, derived from the Latin for flowing, describes what the listener perceives when listening to someone who is truly adept at producing speech. The speech should flow easily and smoothly in terms of both sound and information.

1. What is stuttering?

Stuttering is one of the most common disorders of fluency, onset of which in most individuals is during early childhood, before the age of six years.

According to the standard descriptive definition of stuttering by Wingate (1964): "The term 'stuttering' means: I. (a) Disruption in the fluency of verbal expression, which is (b) characterized by involuntary, audible or silent, repetitions or prolongations in the utterance of short speech elements, namely: sounds, syllables, and words of one syllable. II. Sometimes the disruptions are (e) accompanied by accessory activities involving the speech apparatus, related or unrelated body structures, or stereotyped speech utterances. III. Also, there are not infrequently (f) indications or report of the presence of an emotional state, ranging from a general condition of 'excitement' or 'tension' to more specific emotions. (g) The immediate source of stuttering is some in-coordination expressed in the peripheral speech mechanism; the ultimate cause is presently unknown and may be complex or compound".

Most definitions include at least the following three descriptions of the verbal behavior associated with stuttering; involuntary, repetitions, and prolongations. For example, stuttering is defined in the International Classification of Diseases as "disorders in the rhythm of speech, in which the individual knows precisely what he wishes to say, but at the time is unable to say it because of an involuntary, repetitive prolongation or cessation of a sound" (World Health Organization, 1977, p. 202).

Stuttering, or stammering as it is also referred to, is a developmental speech disorder, which usually appears in children between the ages of 3 and 8 years. More often than not it remits before puberty, but it can persist into adult life. Stuttering is characterized by involuntary

sound/syllable repetitions, syllable prolongations, or interruptions (blocks) in the smooth flow of speech. There may sometimes be difficulty in differentiating infants who definitely stutter from those who show the disfluency often seen in infancy as a normal stage of speech development. However, the two are distinct. The overall frequency of disfluency, the proportion and duration of disfluency types, and the associated behaviors not directly related to speech such as eye, head, and body movements, can help to distinguish between the two.

a. **Age and nature of onset:** The age of onset refers to the age at which an informant reports that he or she first concluded that a child's repetitions and/or other hesitations were abnormal. Unfortunately, very few children have been evaluated by SLPs within days or even weeks of the time the disorder was thought to have begun. Consequently, almost all the information we have about stuttering at onset is from reports by parents and other laypersons, reported months (or years) after the disorder is thought to have begun. The information about the onset of stuttering also is incomplete because much of it is based on what can readily be observed by a layperson through vision and hearing. There are undoubtedly physiological and psychological events associated with it that either cannot be observed without instrumentation or even if observed would be unlikely to be regarded as related to the onset of the disorder. The reports may also be inaccurate because the persons making them either were not aware of child's earliest moments of stuttering or considered them to be normal hesitations. This would tend to make the onset of the disorder appear to have been more sudden than it really is.

   Though the data bearing on this question have to be interpreted with caution for the reasons indicated earlier, they do seem to indicate that the onset can be either sudden or gradual (Yairi, 1983), but usually is gradual (Van Riper, 1982). The percentage of cases reported by investigators in which the onset was gradual are 86 (Ajuriaguerra, 1998), 92 (Morley, 1957) 76 (Preus, 1981), 69 (Berlin, 1954) and 90 (Van Riper, 1982).

b. **Stuttering and gender:** Gender is one of the strongest predisposing factors for stuttering in that the disorder affects many more males than females. In older children and adults the male-to-female ratio is large, about 4 to 1 or greater (Craig, et al., 2002). Except for the higher incidence, until recently no major gender differences, either in

speech or other characteristics associated with the disorder has been demonstrated. Interestingly, however, in preschool children close to stuttering onset, several studies have shown considerably smaller gender ratios, only 2:1 (Yairi & Ambrose, 2005), and 1:1.6 (Kloth, et al. 1995; Mansson, 2000).

Although in the past it was suspected that the age-related substantial decrease in the proportion of females who stutter may be due to processes of natural recovery, data obtained at the University of Illinois' Stuttering Research Program on early childhood stuttering have provided strong evidence to this effect. On the basis of systematic follow-ups of many children over several years, our direct observations established that, indeed, boys have greater risk for developing chronic stuttering. Conversely, girls who begin stuttering have a greater chance than boys to experience natural recovery (without treatment). Specifically, among children who recovered there were 2.3 boys to each girl; in children who became chronic stutterers there were 3.75 boys to each girl. The clinical implications for early risk assessment are obvious.

Possible causes of the unequal sex ratio include various ascertainment biases, incomplete reporting, social role differences, X-linked inheritance, or a combination of environmental and genetic elements. Each of these factors has been examined against data collected in the large family study of stuttering, and all but one has been eliminated. Only the gene-environment interaction hypothesis can be supported by the data. Statistical analysis confirms that the sex effect in stuttering is real and supports a threshold model for the sex difference. The authors, Kenneth, Judith and Records (1978) conclude that the possibility of differences between males and females must be considered in any etiological research in stuttering.

Yairi and Ambrose (1992) indicate a clear tendency for its occurrence under three years of age, and found evidence that girls begin stuttering significantly earlier than boys do. This gender difference is reflected in the commensurately earlier age at which a girl's developing central nervous system matures and seems to support the evidence for a close relationship between the onset of stuttering and the development of speech and language skills. Although in the past, there has been much discussion in the literature about the

common place circumstances, the lack of identifiable provocative events, and typically gradual appearance of early stuttering (Johnson; 1959; Vanriper, 1973), evidence is beginning to emerge to the contrary. Van Riper (1971) and Yairi (1983, 1992) concluded that in many cases the onset of stuttering is clear, well defined and relatively brief. Yairi also noted that severe stuttering had a strong tendency to be linked with a sudden onset.

The research literature on stuttering is extensive, spanning etiology, natural history, phenomenology, and treatment. In the review by Andrews et al in 1983, existing empirical knowledge is distilled by attending only to replicated findings. These are designated as "facts." Facts concerning the natural history of idiopathic stuttering highlight early childhood onset, probability of recovery, and importance of a positive family history of stuttering. Corroborated evidence on stutterer-non stutterer differences concerns intelligence distribution, speech development, central auditory function, and sensory-motor response. Predictable changes in stuttering frequency, and even total elimination of stuttering, occur under a remarkable variety of conditions. Review of therapies revealed two that satisfied the most stringent criteria for good treatment. Various theoretical positions are examined for their fit with the established facts. A model of stuttering as a genetically determined reduction in central capacity for efficient sensory-motor integration is preferred, provided acquisition of secondary symptoms is attributed to instrumental learning.

The sex distribution of subject samples is another critical factor. Girls are considerably more likely to recover than boys (Ambrose, Cox & Yairi, 1997). Thus, a sample of stuttering subjects that reflect a higher female to male ratio than expected for children who stutter at the particular age, and that also includes very young children, some of them with very brief histories of stuttering (eg. Fosnot, 1993), could easily yield a high success rate that may not validly reflect therapeutic influence. In the context of clinical efficacy research, it is also essential to recognize that other population subgroups have emerged in stuttering, such as stuttering with comorbid disorders, communication or otherwise (Conture, Louko, & Edwards, 1993). Such subgroups may respond differently to treatment.

It is suspected that underlying the gender ratio in stuttering are genetic factors (likely affecting brain structures associated with speech-language processes). For example, in families of children who stutter, more fathers stutter than mothers and more brothers stutter than sisters. Most recently, Cox et al. (2005) carried this step further reporting gender differences in chromosomal signals for stuttering. Hence, the disparity in sub-populations is likely to provide a window to the understanding of stuttering, its cause, and amelioration. All in all, the gender factor in stuttering is viewed as a priority research target.

c. **Stuttering and family history:** At least 25 studies have investigated family patterns in the incidence of stuttering. The results vary widely. Most studies are contradicted by other studies. Ambrose, Yairi, and Cox, (1993) noted between 20% and 74% of stutterers reporting they have a relative who stutters. But other studies found that 1% to 42% of non-stutterers reporting they have a relative who stutters (Ambrose, Yairi, & Cox, 1996). That is, many stutterers and non-stutterers report they have relatives who stutter. Andrews et al., (1983) found that if you stutter, you are about three times more likely to have a close relative who stutters. Studies of the families of stutterers failed to find simple Mendelian types of inheritance, such as sex-linked, autosomal dominant, or recessive.

Ambrose, Yairi, and Cox, (1993) in their study of children aged 2 to 6 found that more than two-thirds of CWS have relatives who stutter. This study found that male and female children were equally likely to have relatives who stutter. This study also found that stuttering was more likely in first-degree relatives than in second- or third-degree relations.

One advantage of family and twin data is that even when they suggest the involvement of genetic factors, they can provide little information on the number of genes involved or in the forms in the interaction with the environment. Data on complete family provide such information. The major weakness in family data is that the cultural transmission is largely impossible to exclude as an alternative hypothesis.

Genetic studies affect both males and females equally which has important implication for the genetic studies that exclude young children. According to Kidd (1984) a major deficiency in most previous studies was their self-imposed limitation of reporting only the presence of positive family history.

According to Cooper (1972) few individuals with stuttering are genetically predisposed to relapse. Clients with genetic loading who have a family history of stuttering may possess an underlying physiological or neuro-physiological condition (Boberg, 1986). However, Felsenfeld (1998) reported that although it is true that stuttering is familial in the population and it may be true there is a familial tendency for recovery, sufficient empirical justification to use a family history profile to predict outcome for any given client is not possible. Children who recover from stuttering without receiving intervention tend to have more relatives who also recovered than do children who continue to stutter (Curlee & Yairi, 1997). Also, it has been assumed that FHP status may also predict whether children who do not recover either show relapse following treatment or exhibit stuttering which is resistant to therapy (Boberg, Howie & Woods, 1979; Yairi, 1997). However there is no conclusive evidence of a relationship between these variables.

d. Stuttering and awareness/attitude: The emergence of awareness of stuttering has been an important factor in theoretical and clinical considerations for early childhood stuttering. In stuttering research, the term ‘‘awareness’’ refers to being partially and acutely aware of speech difficulty/stuttering. Awareness is assumed to interact with the onset and development of stuttering.

In earlier models of onset of stuttering, awareness has even been considered as a causal factor. Johnson et al. (1959) concluded that normal disfluency leads to stuttering due to parental reactions making the child aware of not speaking well. However, awareness has also been found to be absent in a child near the onset of stuttering and becoming apparent several years later (e.g., Bluemel In Bloodstein, 1995; Hansen & Iven, 2002; Sandrieser & Schneider, 2001; Van Riper, 1973). Furthermore, awareness has been thought to interfere with stuttering, triggering stuttering events (e.g., Brutten & Shoemaker, 1967; Johnson et al., 1959), initiating the development of stuttering, as well as facilitating

emotional and behavioral reactions in response to the speech disfluency (e.g., Bloodstein, 2001; Conture, 2001; Kalinowski & Saltuklaroglu, 2006; Van Riper, 1973). Awareness of stuttering has been considered by clinicians as an indicator of persistence of the disorder and a recommendation for intervention for very young children, although there is limited evidence for such a prediction (Yairi & Ambrose, 2005).

According to Boey, Van De Heyning, Wuyts, Heylen, Stoop, & De Bodt, (2009), awareness has been an important factor in theories of onset and development of stuttering. They studied a total group of 1122 children with mean age of 4 years 7 months (range 2-7 years old), with parental-reported unambiguous verbal and non-verbal reactions as a response to stuttering were collected. Awareness was observed for 56.7% of the very young children (i.e., 2 years old), which gradually increased with age up until 89.7% of the children at the age of seven. All considered age-related factors (i.e., chronological age, age at onset and time since onset) and stuttering severity were statistically significantly related to awareness.

Presently, there are few data which directly assess the speech attitudes exhibited by children who stutter. DeNil and Brutten (1991) published the results of a study in which they administered a Dutch version of The Communicative Attitude Test (Brutten & Dunham, 1989) to a group of school-age (7-14 years) Belgian children who stutter and a control group. Results indicated that CWS exhibited significantly more negative attitudes toward speech than did their CWNS and that speech related attitudes became more negative with increasing age for the stuttering children (the non stuttering group showed the opposite trend). They also observed that those children judged to exhibit "severe" stuttering possessed the most negative speech attitudes, while children whose stuttering was judged to be "mild" and "moderate" displayed more positive attitudes about talking.

e. **Stuttering and situational variability:** Normal speakers have fear of speaking situations similar to the IWS, which have been looked into by few authors. Shaw (1967) studied “speech fright and speaking ability in 420 children from kindergarten through 6th grade

and reported that at least 20% of the children were considerably concerned about speech fright. It is of interest that he found no apparent relationship between speech fright and speaking ability. If fluency, normal non-fluency and stuttering all occur in the presence of fear of speaking, there is no special connection between the fear of speaking and stuttering. The role of fear of speaking is not specific. It might well be that stuttering is more likely to occur, or increase under conditions of fear, but fear is at best a precipitant and stuttering could be due to something else.

f. **Stuttering and anticipation:** Very little is known about the relationship of expectancy to stuttering in spontaneous connected speech. The available research findings have been obtained under quite artificial conditions that are likely to exaggerate the manifestation of expectancy. This is particularly true of certain studies (eg, Johnson et al., 1937; Johnson and Sinn, 1937), which also happen to have shown the most dramatic occurrence of expectancy. Studies which are somewhat less vulnerable to this criticism have yielded much less impressive results. For instance Johnson and Solomon (1937) found stuttering to occur on only about 53% of the words expected; Johnson and Ainsworth (1938) reported a similar figure while Peins (1961) indicated that her subjects were "not very accurate" in their predictions of stuttering. Martin and Haroldson (1967) found a concurrence of expectancy and stuttering to be less than 50%.

g. **Stuttering and Language problems:** The study by Ryan (2000) is the second in a series of reports concerning stuttering pre-school CWS enrolled in a longitudinal study. Conversational samples of 20 stuttering and 20 non-stuttering pre-school children and their mothers were analysed for speaking rate, conversational speech acts, interruption, and linguistic complexity. Between-group analyses revealed few differences between either the two children or two mother groups. Within-group analyses indicated differences that involved conversational speech acts and linguistic complexity. Most stuttering occurred on statements (*M*=32.3%) and questions (*M*=20.9%). Stuttered and disfluent sentences had higher Developmental Sentence Scoring (DSS) (Lee, 1974) scores (*M*=10.9, 12.9, respectively) than fluent sentences (*M*=7.6). Multiple correlation

analyses indicated that speaking rate of mothers (0.561) and normal disfluency of children (0.396) were major predictor variables.

Borsel, Maes and Foulon (2001) reported that although stuttering in bilinguals is an area of interest to both clinicians and researchers, data on bilingualism and stuttering are scanty. This paper reviews the available literature on stuttering and bilingualism. Major findings are that stuttering is probably more prevalent in bilinguals than in monolinguals, that stuttering can affect one or both languages, that the two languages may be equally or differently affected, and that diagnosis and treatment in bilingual stutterers seem to require a particular approach.

h. **Stuttering and phonology:** In the profession of speech-language pathology, there is a strong belief that phonological disorders frequently occur in children who stutter. Nippold, (2001) examined the recently published studies that addressed the frequency with which the two disorders co-occur. Unfortunately, methodological problems with the earlier studies limited the conclusions that could be drawn. Because of the uncertainty generated by those studies, researchers since 1990 have continued to investigate this topic. Based on the previous review, it is argued that more rigorous methods are needed, including the use of more objective and comprehensive measures of phonological development and matched control groups of non-stuttering children. The current review indicates that frequency rates vary widely from one study to another, making it difficult to state with confidence just how often the two disorders co-occur.

Paden and Yairi (1996) observed that young children whose stuttering persisted (PWS 36 months or more post onset) exhibited a higher percentage of phonological errors than did their normally disfluent peers, or a matched group of children who recovered from stuttering anywhere from 18 to 36 months post onset. They concluded that for some children who stutter, coexisting phonological deficits in the beginning stages of their stuttering problem are associated with non recovery. A number of recent studies and reviews of the pertinent literature (e.g., Nippold, 1990; Wolk, Edwards & Conture, 1993) have shown that there is relatively a high prevalence of phonological delay or disorder within the population of children who stutter, as compared to their non stuttering peers.

Further, Conture, Louko and Edwards (1993) and Bernstein and Ratner (1995) described the clinical observation that children who stutter and exhibit coexisting phonological problems sometimes make little or no progress in therapy, or take longer to show improvements in speech fluency over the course of treatment. These children may also demonstrate qualitatively different stuttering behavior than their stuttering counterparts who exhibit normal phonological systems. Hence presently, it has been suggested that simultaneous treatment of stuttering and disordered phonology is the preferred therapy route, because such an approach best reflects the interacting processes by which children acquire speech, fluency and language.

i. **Rate of speech and stuttering:** Speech duration has been the subject of acoustic studies due to its relationship with rhythm and speech rate. The speech analysis of IWS has revealed data which often differs from that found in IWNS. These differences most likely stem from timing disturbances related to speech motor control.

Jannsesn, Kraaimaat, and Brutten (1995) found that for children who later developed stuttering, their pre- onset speaking rate was faster than that of their normally fluent peers. Hall, Amir, and Yairi (1999) also reported that on average, children who recovered from stuttering exhibited a slower speaking rate than those whose stuttering persisted (as well as normally fluent children).

Ryan (2000) assessed several conversational variables longitudinally and reported a significant positive correlation between mothers' speaking rate and their children's stuttering rate. However, he did note that the relationship between speaking rate (of children who stutter and their mothers) and the development of stuttering remains unclear, and conflicting findings have been reported in the literature. Once stuttering has developed in children, it can be exacerbated when the child who stutters and his or her parent both use a fast rate of speech (Bloodstein, 1995; Meyers & Freeman, 1985). Meyers and Freeman (1985) reported that mothers of children who stuttered spoke significantly faster to children who did and did not stutter, and at a faster rate of speech than did mothers of children who did not stutter. They also found that children who

stuttered spoke slower than children who did not stutter, and that children who had been diagnosed with severe stuttering spoke slower than children who had been diagnosed with moderate stuttering. Furthermore, Meyers and Freeman reported a significant negative correlation between speaking rate and amount of stuttering; that is, the more children stuttered, the slower they talked during fluent speech (and the faster their mothers talked while interacting with their child). Guitar, Schaefer, Donahue-Kilburg, and Bond (1992) also reported a significant correlation between a mother's speaking rate and her child's amount of stuttering. These findings suggest that speech rate may contribute to the onset, development, and maintenance of stuttering.

Speech rate reveals a processing demand that can result in increased disfluency while the Diadochokinetic rate (DDK) has been considered as an indication of the speaking ability/capacity of a child. Yaruss, Logan and Conture (1995) evaluated the hypothesis that stuttering may be associated with a discrepancy between a child's speaking performance indicated by articulatory speaking rates and speaking ability indicated by DDK rates. Yaruss Newman & Flora (1999) found that 9 children with no stuttering between the age of 4-5 years, exhibited a strong positive correlation between their articulatory speaking rate and their diadochokinetic rate indicating that these children speak at rates in line with their abilities. On the other hand, the nine children who stuttered showed a mild negative correlation between speaking rate and DDK suggesting that children who stutter may attempt to use speaking rates that exceed their ability to rapidly and precisely move their articulators. Yaruss (1997) found a trade off between production rate and DDK accuracy. Children exhibiting faster DDK rates also produced more errors than children with slower DDK rates, again suggesting that children who produced more errors were actually exceeding their ability to rapidly and precisely move their articulators in a speech related task. A study investigating persistence and remission of stuttering in high risk children by Kloth, Kraaimaat, Janssen and Brutten (1999) indicated that children who stutter speak faster than their abilities allow and that the high risk children who developed stuttering subsequently on follow up differed only with respect to their speaking rates compared to those who did not. These results appear to

provide support that children who stutter perform at speaking rates beyond their motor abilities.

2. Subtyping stuttering: It is essential to consider subtype research, particularly in studies of children. Attempts have been made by various researchers to sub group children and adults with stuttering based on age, gender, family history, associated problems etc. It is necessary to include multiple factors or domains in the data collection process, especially with young children during the formative years of the disorder, when substantial overlap in the development of several speech/language domains occurs. Because the utilization of information on genetically milder subtypes may aid in identifying the mode of transmission in disorders which do not show clear inheritance patterns, it may be interesting to see whether recovery from stuttering can be considered a genetically milder subtype of stuttering.

Schwartz and Conture (1988) analyzed speech samples of Forty-three young stutterers (10 girls and 33 boys), both stutterings and associated behaviors during conversations that were video/audio recorded. Fourteen associated speech and non speech behaviors and speech disfluency types were identified and quantified for 10 stutterings from each of the 43 subjects. The 14 associated behaviors and speech disfluency types were further reduced to form three related indices: (a) Sound Prolongation Index, (b) Non speech Behavior Index, and (c) Behavioral Variety Index. They suggested that five subgroups of young stutterers could be identified and described on the basis of these youngsters' number and variety of speech and non speech behaviors associated with their stuttering.

Yairi, Ambrose, Paden & Throneburg (1996), followed more than 100 preschool children who stutter for several years from near the onset of stuttering using a multiple data collection system, with 45 non-stuttering children serving as controls. Thirty-two stuttering and 32 control subjects who have progressed through several stages of the investigation were identified for an in depth analyses based on which they identified four subgroups: persistent stuttering, late recovery, early recovery, and control group. Comparative data for the groups with special reference to differences in frequency of disfluency, acoustic features, phonologic skills, language development, nonverbal skills, and genetics suggested several promising predictors of recovery and chronicity.

3. Some causative factors attributed to stuttering:

Stuttering has been attributed to various causative factors from the time of Aristotle during 400 BC and the frame of reference has been shifted from psychogenic to physiogenic back and forth several times over the decades. Recent theories however, emphasize the role of both nature and nurture in explaining the cause for stuttering.

During 1940s speech-language pathologists believed that stuttering was caused by parental reactions to normal childhood dysfluencies. The Iowa family study proved what the speech language pathologists believed. In 1986, a speech language pathologist re-examined the 1940 Iowa study and concluded that, “genetic transmission has been judged to provide an equally viable explanation for the data”. At least 25 studies have investigated family patterns in the incidence of stuttering. The results vary widely. Most studies are contradicted by other studies. The major weakness in family data is that the cultural transmission is largely impossible to exclude as an alternative hypothesis. According to Kidd (1984), a major deficiency in most previous studies was their self-imposed limitation of reporting only the presence of positive family history.

Orton and Travis observed that many stutterers seem to be left handers who changed into right handers (Travis, 1931). They suspected that this change led to conflicts in the control of speech in which neither hemisphere was fully in charge of the structures used for speech. The lack of dominant hemisphere they reasoned created neuro-motor disorganization and mistiming of speech which resulted in stuttering. Several authors believe that the known factors about stuttering point toward a disorder of timing. Van Riper (1982) stated that when a person stutters on a word there is temporal disruption of the simultaneous and successive programming of muscular movements required to produce one of the word’s integrated sounds.

Johnson’s diagnosogenic theory states that assigning the label stuttering a speaker's repetitions of sounds and syllables and other hesitancies actually caused the disorder. Parental responses to their children's early speech efforts were mediated by their "diagnoses" of this speech as the disorder "stuttering," and this led to chronic "stuttering." It was not the word stuttering that caused "stuttering": it was reactions to the word that created the undesirable

reinforcement of stuttering. Oliver Bloodstein (1987, 1997) proposes that stuttering emerges from a child's experiences of frustration and failure when trying to talk.

A third interactional view on stuttering onset was proposed by Demands and Capacities model. This view suggests that disfluencies, as well as real stuttering emerges when a child's capacities for fluency are not equal to speech performance demands.

Many researchers have also been intrigued by the influence of linguistic factors on stuttering. Stuttering often begins when a child enters a period of intense language development. Postma and Kolk (1997) developed the Covert Repair Hypothesis to explain stuttering from a language production point of view. They believed that both stuttering and normal disfluencies result from an internal monitoring process that we all use, to check if what we are going to articulate is exactly what we mean to say. Oliver Bloodstein (1987, 1997) proposed that stuttering emerges from a child's experiences of frustration and failure when trying to talk. Similarly, stuttering is more frequent when the load on language function is heaviest (Bloodstein, 2002). These factors have prompted several theorists to propose that stuttering reflects impairment in some aspects of spoken language.

According to the Mutli-factorial dynamic model, the symptoms of stuttering are like smoke coming out of a volcano; they tell us little about the underlying processes that produce the phenomenon. According to Smith, Kelly and others, stuttering evolves from essentially normal systems that interact poorly; Neural pathways are dynamic and self-learning; abnormal patterns can self-perpetuate and become stable. Problems integrating systems are apparent in PWS; linguistic and cognitive demands impair their motor functioning more obviously than in PWDNS. This viewpoint is similar to DeNil and colleagues' Neurophysiological Model, in which learning of new skills is seen to change physiological markers of speech/language processing.

4. Recovery from stuttering:

A substantial number of CWS do get over stuttering without therapeutic intervention. With stuttering conceived as a self generated emotional problem, or as a learnt behavior, which is instate and maintained by mysterious processes of reinforcement, there is an inherent

assumption that stuttering will not get better except through therapy. In effect, this position is required by any theoretical interpretation of stuttering which conceives it to be a psychological problem.

It is reported that nearly 40% of CWS need not worry a clinician, because before the age of eight, through general cerebral maturation assisted by developmental factors in the environment, stuttering subsides. In a few of these individuals, there appears to be but slight remnants of an earlier severe type of stuttering (Bryngelson, 1938). In a later publication (Bryngelson, 1943) again reported the figure of a 40% recovery rate in reference to a review of 1492 cases seen at the university of Minnesota Speech clinic. At an earlier date Johnson (1934) had also noted that 30-40% of young CWS "outgrew" stuttering by the time they were 8 or 9 years of age. Much later Johnson (1955) reported the findings of the study, "….designed to yield information concerning the characteristics of stuttering at its onset, and to explore the problem of the changes that occur as stuttering develops through the early stages into its more advanced phases." Although he indicated an interest in the "conditions surrounding the onset, aggravation, alleviation and disappearance of the disorder," he devoted much more attention to factors possibly related to onset and aggravation than to amelioration.

It is reported that the older the age group surveyed, the higher is the proportion of recovered stutterers likely to be found, as Dickson (1971) and Cooper (1972) showed, and by adulthood the percentage of recovered stutterers may be as high as 80%. Some researchers are skeptical about a figure so high when based upon survey respondents' diagnoses of themselves as recovered stutterers. Young (1975) suggested that some of these individuals may not be distinguishing adequately between stuttering and normal disfluency, and such doubts are given some substance by the finding of Lankford and Cooper (1974) that two thirds of the parents of 68 self diagnosed, recovered stutterers of junior and senior high school age said, when interviewed by telephone, that they did not believe that their child had ever stuttered. Although these inconsistencies suggest the need for more research, it is quite possible that we are dealing with the kind of question that can have no exact answer. If, as is possible mild episodes of troublesome disfluency are commonplace during childhood, the question of precisely how many

children recover from "stuttering" ultimatetly becomes a matter of what we are willing to define as stuttering.

a. **Spontaneous Recovery:** Concomitant with the incidence of new cases of stuttering during childhood, and offsetting it, there is a continuous tendency for stuttering to disappear of its own accord. Of those who at any time begin to stutter, a large proportion will stop by the time they reach adulthood. In the longitudinal investigation reported by Andrews and Harris (1964), the percentage of stutterers who recovered by 16 years of age was 79.1. This included early episodes of brief duration. There is also a report by Fritzell (1976), who followed the progress of 90 PWS, most of whom originally ranged in age from 7 to 9 years, and found that 10 years later, 46.7 percent no longer stuttered.

   Although estimates of the incidence and prevalence of stuttering is greatly influenced by the central tendencies of various reports, it would seem to indicate that about 5% of the population has stuttered at some time, whereas only 1% stutters at a given time (Andrews & Harris, 1964; Bloodstein, 1995). By inference, the discrepancy between these two figures of incidence and prevalence suggests that the disorder persists in only the minority of all cases involved. Or conversely, there appears to be a high rate of remission of stuttering. In case where no clinical intervention has occurred, the phenomenon has been known in the literature as spontaneous recovery.

   Other evidence for spontaneous, unaided recovery has been provided by studies designed to assess its occurrences directly. For 60 years since Bryngelson (1938) made the observation that a substantial number of young children who stutter outgrow the disorders, the clinical and research literature has reported many estimates of spontaneous recovery. Data have varied from a low of 32% (Johson et al 1959) to 70% (Andrew & Harris, 1964) and possibility of even higher estimate (Yairi & Ambrose, 1992). In a major review of the literature, Wingate (1976) estimated that the overall recovery rate is approximately 43% by age 14. Nevertheless he suggested several reasons to believe that the recovery rate may be well above that composite value. Such diversity of findings is understandable given that most of the information has been generated through retrospective studies of adults or high school students and from reports of parents of

young children which depended on long term memory of presenting symptoms (Dickson, 1971; Johnson et al., 1959; Sheehan & Martin 1970). Furthermore, these investigations lacked tight criteria for recovery, objective speech based data to substantiate variations in stuttering or claims of remission, and due consideration of epidemiological factors in the composition of their subject sample, all of which may significantly affect the result.

Johnson (1955) reported the findings of the study, "….designed to yield information concerning the characteristics of stuttering at its onset, and to explore the problem of the changes that occur as stuttering develops through the early stages into its more advanced phases." Although he indicated an interest in the "conditions surrounding the onset, aggravation, alleviation and disappearance of the disorder," he devoted much more attention to factors possibly related to onset and aggravation than to amelioration. The stuttering group consisted of 46 children, 33 boys and 13 girls, having a median age of 4 years two months at the time the study was begun. It was considered desirable to study children in whom stuttering was of recent origin. For 75% of these youngsters, the interval between reported age of onset and time of initial interview was less than a year; the median interval was five and a half months. The median age of onset of stuttering was 3 years; for 75% of the young stutterers, onset was reported to have occurred prior to three years 2 months. These children were followed over varying periods during the course the study, which extended for about five years. The judges disagreed in only three cases, which is the reason for the "indefinite" category. These data indicate that 85% of these CWS had shown improvement, and that 72% of them could be considered to have recovered during the period of approximately two and a half years that they were under observation. Reportedly, the recovery occurred gradually. None of these children received any direct professional attention. Johnson implied that the favorable outcome was due to parent counseling, in which they were advised to regard their youngsters as capable of normal speech, to lower their standards for speech and behavior generally, making it easier for the child to feel success and approval.

Sheehan and Martyn (1966) investigated the puzzle of the non persistence of stuttering in many cases in which it begins, using structured interview- and sentence-completion data

on all incoming University of California, Berkeley, students. Thirty-two spontaneously recovered PWS were compared with 32 active PWS and the normal controls, and a computer bivariate association analysis showed: (1) four out of five recover from stuttering spontaneously; (2) fewer of those who had received public school speech therapy recovered from stuttering; (3) fewer of those who had ever been severe recovered spontaneously; (4) no familial incidence pattern with either group of stutterers as compared to controls; (5) no differences in reported handedness in stutterers or their families; (6) improvement attributed to self-acceptance and role acceptance and there appear to be many different paths to recovery.

Recovery from stuttering was studied in the Tuscaloosa, Alabama junior and senior high schools by Cooper (1972). Of 5054 students interviewed, 119 active stutterers were observed and another 68 students reported recovery from stuttering. This one-third recovery rate for the total population, while contrasting with a four-fifths recovery rate reported in a college student study varied from less than one-third in the junior high school group to approximately one-half in the high school population. In an investigation by Finn (1996) eleven of fourteen subjects self reported as recovered continued to practice speaking with a modified speech pattern. In a separate study using many of the same subjects (Finn, 1997), nine of fifteen "recovered" subjects stated that they still had a tendency to stutter. So while a spontaneous and total cessation of stuttering can happen, it is atypical by any definition and, by some, requires diligent adherence to speech modifications.

Andrews et al (1983) reported recovery rates from 23% to 80% when they reviewed research from all available studies. With evidence that as many as 80% of children might recover without help it is easy to understand why so many professionals advised parents that they should not worry about it and the problem would "go away". Van Riper (1971) and Yairi (1983, 1992) concluded that in many cases the onset of stuttering is clear. Well defined and relatively brief. Yairi also noted that severe stuttering had a strong tendency to be linked with a sudden onset.

Seider, Kidd and Gladstien (1983) examined the recovery and persistence of stuttering in the first-degree relatives of a large group of adult persistent PWS. The percentage of recovered individuals reported in these families supports the hypothesis that recovered and persistent stuttering are not independent disorders. Sex and type of relative were significant variables in the distributions of recovery and persistence of stuttering. Handedness in male subjects and birth order did not distinguish between recovered and persistent PWS. Female recovered stutterers had significantly earlier ages of stuttering onset than the other groups (male recovered stutterers and male and female persistent stutterers). Females also tended to recover earlier than male recovered stutterers, and the durations of stuttering symptoms were similar in both sexes.

A few longitudinal studies that enabled closer monitoring of recovery in children observed from near the onset of stuttering have provided more reliable data. In these investigators found recovery of 79% (Andrew & Harris, 1964), 80% (Panell et al., 1978), 65% (Ryan, 1990); figures that are more consistent with each other.

In 1992, Yairi and Ambrose reported for the first time systematic, speech based, longitudinal data on the development of childhood stuttering. This small-scale study was primarily aimed at developing the mechanism and procedures for longitudinal investigation of stuttering and the study was not intentionally planned to study recovery. Nevertheless, the data indicated a large reduction in dysfluencies during the first 14-16 months post onset, with 65% complete recovery during first 2 years after onset and additional recovery at a later time. Their pilot study included only 27 preschool age children who stuttered of whom 18 were exposed to minimal intervention and 9 wore not. No difference in recovery trends were observed between these two subgroups. The authors report that much of the reduction took place near the end of the first year post onset indicating group differences between chronic and recovering groups which became distinct by approximately 20 months post onset. This evidence clearly indicates the importance of obtaining accurate information about the timing and circumstances pertaining to the onset of dysfluency as it facilitates the identification of those children

who are likely to need early intervention in order to avoid the development of a chronic problem.

Ramig (1993) contacted the families of 21 children who stuttered 6 to 8 years after their child first were diagnosed as needing intervention for stuttering. The vast majority of these children still were exhibiting a stuttering problem at the time of reassessment. Based on the findings of this survey, there may be reason to question or dispute the high spontaneous recovery rates reported in the literature. Early intervention for the child who stutters during the preschool and elementary school years is encouraged in order to increase a child's probability of coping with a stuttering problem that may not be resolved on its own.

Of particular interest is a recent longitudinal study reported by Manson (1997) who had the unique opportunity of having access to the birth records of all children, approximately 500, born annually on the Island of Bronholm. Manson and a team of four other clinicians conducted individual face to face speech language and hearing evaluation, within a month or two following their third birthday, of the entire population of 1,040 children, born during 2 years period (98% of the recorded births). The investigator reported that 4.9% of the children exhibited stuttering, a figure identical to that found by Andrews and Harris (1964) in a Scottish population of a similar size. Manson also reported that a follow up evaluation 2 year later revealed a recovery rate of 71.6%. The likelihood of intervention, however, was not clear. A recent update of the data places the observed incidence at 5.09%. Reported recovery 5 to 6 years after initial identification was 85%.

Hancock & Craig (1998) studied 77 children and adolescents aged 9-14 years who were diagnosed as having stuttering for at least one year. All successfully participated in treatment and were assessed 12 months later. Possible determinants investigated consisted of pre and post treatment factors including demographic variables, severity of stuttering, and anxiety levels. A standard regression analysis was performed to isolate factors that predicted the likelihood of relapse. Only pretreatment stuttering frequency measured by percentage syllables stuttered and trait anxiety post-treatment significantly

predicted stuttering frequency one year post treatment. Those having a severe stuttering before treatment and those who were less anxious immediately post treatment were those susceptible to higher levels of stuttering in the long term. Although frequency of stuttering is not an exhaustive measure of relapse, the present study offers an elementary ability to predict those children at risk of relapse following successful treatment.

Yairi and Ambrose (1999) reported on their longitudinal study, large in scope (84 children), sample epidemiologically sound, evidence from speech based data, multiple speech samples in different conversational contexts and on different days. They also had the validity of the able and multiple classification criteria, increased confidence in the efforts of determining persistency and recovery. It was seen that 26% persisted and almost 74% exhibited recovery and there was also a gender factor in that of those who recovered 35% were female, but of those who persisted, only 1.8:2 for the recovered group.

A critical review of research by Young (1999) concerning age of onset, prevalence, and recovery from stuttering indicated some inconsistencies among the findings; the reported recovery rates may be too high, although all data sources had limitations. Duration of stuttering tends to run from 6 to 35 months for most, with some children stuttering as long as 3 to 4 years before recovery. Females tend to recover at earlier ages. Recovery for females was found to be between 12 and 30 months following onset, whereas for males, the range was between 24 to 36 months after onset.

b. **Age of spontaneous recovery:** Shames and Beams (1956) gathered evidence indicating that stuttering may continue to become less prevalent even in older age groups. Studies of recovered adults by Wingate (1964), Shearer and Williams (1965), and Martyn and Sheehan (1968) showed that the age varied within a very broad range, although there was a considerable tendency to recall recovery between about ages 13 and 20 years. In one of these studies the earliest age at which recovery was reported by these adults were 9 years. In another it was 5. When parents are informants, the age is pushed back considerably. In his study of school children, Dickson (1971) found the peak age of spontaneous recovery to be 3.5 years, with the great majority of former stutterers having recovered by age 6. In

most of the cases the stuttering had lasted no more than 2 years, often no more than a few months.

Better estimates of the more typical recovery patterns have emerged with longitudinal research such as that reported by Yairi and Ambrose (2005) and demographic studies in which the same children may be tracked over time, such as the Danish Study by Mansson (2000), a study of High risk Dutch children (Kloth, Kraimaat, Janssen, & Brutten (1999), and a study of German children conducted by Rommel, Hage, Kalehne, and Johannsen (2000). In these cases the same criteria were used to define and classify the children, and results tend to confirm the impression reported previously that most cases last no more than two to three years, with very frequent recovery in the first few months after symptoms emerge. In Yairi's corpus, 31% of children (whose mean age at onset was three years) had recovered within two years, 63% by three years post onset, 74% by four years, and almost 80% by five years after stuttering onset. In the Mansson's cohort, more than 71% of children had stopped stuttering within two years after their initial identification. The Dutch children in the Kloth et al study were being tracked prospectively because at least one of the parents was an adult stutterer. Seventy percent of them were found to have recovered without intervention within four years after identification. Consistent with these is a small sample of twenty two 2 to 3 year old children reported by Ryan (2001), of whom almost 70% recovered without intervention by the two year follow up. In the Rommel et al. sample, children were identified relatively later than in these other studies, at around age five. Three years later, 71% were found to have recovered. This pattern contrasts with that found by Ramig (1993), who found relatively little recovery for children identified later, between almost 5 and 8 years of age.

It appears from all available finding that some degree of recovery may occur at any age. However, Seider, Gladstein, and Kidd (1983) reported that among 132 stutterers' relatives who had recovered from stuttering, the ages of recovery ranged from 3 to 38 years. As we might expect the younger the person, the better are the chances of recovery.

The data of Seider, Gladstein and Kidd show a decreasing probability of recovery with age.

c. **Recovery with treatment:** It is difficult to be definitive about the proportion of children who will recover without therapy as the research reports wide variations. Andrews et al (1983) reported recovery rates from 23% to 80% when they reviewed research from all available studies. With evidence that as many as 80% of children might recover without help it is easy to understand why so many professionals advised parents that they should not worry about it and the problem would "go away".

Starkweather (1987) stated that 20% and perhaps as many as 50% of children whose parents notice excessively repetitive speech behavior will go on to exhibit chronic dysfluency. Although, the reported figures are so variable, the body of evidence that we have available indicates that an in depth understanding of all the factors that contribute to the development of early childhood dysfluency is essential in order to be able to make an informed statement about whether a particular child is at risk of developing stuttering.

In the study by Ramig (1993), the families of 21 children who stuttered were contacted 6 to 8 years after their child first was diagnosed as needing intervention for stuttering. The vast majority of these children still were exhibiting a stuttering problem at the time of reassessment. Based on the findings of this survey, there may be reason to question or dispute the high spontaneous recovery rates reported in the literature. Early intervention for the child who stutters during the preschool and elementary school years is encouraged in order to increase a child's probability of coping with a stuttering problem that may not be resolved on its own. In any case these modifications, along with motivation to change, were reported as the biggest factors in the recovery of the subjects noted above (Finn 1996). Motivation was also found to be important in a study by Quarrington (1977), in which 20 of 27 subjects attributed their recovery to attitude change. From the research then, one can say that changes in speech and desire to improve can lead someone to declare himself or herself recovered. Given that both factors are common to many people who stutter, however, most of whom never make such a declaration, adult spontaneous recovery

remains a mystery. As we come to better understand the nature and specific role of factor(s) that is (are) genetically transmitted, it may be possible to develop more specific criteria and/ or tests that will allow clinicians to improve their ability to detect those children that are at greatest risk for developing chronic stuttering. Whether or not the presence of a positive family history also has value in predicting treatment outcome in older children or adults is presently an open question (Janssen, Kraaimaat, & Brutten, 1990).

The objectives of the pilot study by Yairi and Ambrose (1992) were to establish methods for longitudinal research of stuttering in children and to provide preliminary data on the variations that occur in disfluencies during the developmental course of stuttering. Twenty-seven preschool-aged children were followed for a minimum of 2 years shortly after they began stuttering. Tape-recorded speech samples were obtained from the children at several intervals during this period. The number of various types of disfluencies was counted in the speech samples obtained in each testing period. Twenty-one children continued to be followed for varying periods of up to 12 years. Eighteen of the 27 subjects received a few speech treatment sessions during the initial period of the study, whereas 9 children did not receive direct treatment. Results indicated that for the two subgroups there was a marked deceleration over time in the mean frequency of stuttering-like disfluency. Individual subjects' data showed considerable variability in the longitudinal development of disfluency but most subjects followed the patterns of the group means. Much of the reduction took place during the early stage of the disorder, especially near the end of the first year post-onset. There were indications that group differences between chronic and recovering stutterers become distinct by approximately 20 months post-onset.

According to Yairi and Ambrose (1999), the divergent developmental course of stuttering with its two major paths, persistency and spontaneous (unaided) recovery, has been a focus of scientific attention because of its critical theoretical, research, and clinical perspectives. Issues concerning factors underlying persistency and recovery and their implications for early intervention have stirred considerable controversy among scientists. In light of the

intense interest, the scarcity of direct essential epidemiological data concerning the magnitude of the two paths and the timing of recovery is problematic.

Saltuklaroglu and Kalinowski (2011) studied treatment related recovery (e.g., immediate decreases in stuttering frequency and a 60–80% recovery rate from stuttering). They reported that numerous therapeutic protocols for treating childhood stuttering have been used, many of which have been diametrically opposite in their orientations and implementations. For example, Johnson advocated indirect treatments that simply advocated refraining from drawing any negative attention to childhood dysfluencies as persistent and chronic stuttering was thought to progress via negative parental reactions to normal dysfluencies. In contrast, direct interventionists sought immediately to eliminate stuttered speech patterns by training 'corrected' speech models that usually involved some form of prolonged speech. However, reports from speech and language therapists around North Carolina, USA, suggest much lower recovery rates in the children they treat (i.e. 13.9% over a median therapeutic period of 3 years), which is an indicator of therapeutic inefficiency and ineffectiveness. The discrepancy between these recovery rates calls for a re-examination of the efficacy of stuttering therapy for children, especially in light of recent statements from some therapies suggesting that therapy might be curative in nature.

Spontaneous and complete recovery (removing all overt and covert markers of the pathology) occurs in 60–80% of all children who display incipient stuttering behaviors. As such, it appears that many claims of therapeutic success in children who stutter are confounded by the possibility of spontaneous recovery during the testing and intervention period. That is, it is impossible to discriminate between recovery that would occur naturally from that occurring with treatment.

d. Predictors of recovery in young stutterers: Recovery from stuttering was studied in the Tuscaloosa, Alabama junior and senior high schools by Cooper (1972). Of 5054 students interviewed, 119 active stutterers were observed and another 68 students reported recovery from stuttering. This one-third recovery rate for the total population, while

contrasting with a four-fifths recovery rate reported in a college student study varied from less than one-third in the junior high group to approximately one-half in the high school population. Familial incidence of stuttering was negatively related to recovery from stuttering. A positive relationship was found between parental identification of stuttering and their receiving speech therapy. No relationships were observed among recovery and stuttering severity, participation in therapy, and the nature of initial disfluencies.

A more serious problem appears to emerge in the growing body of clinical efficacy studies with preschool-age children. All these epidemiological factors, age sex and risk factor (persistence/recovery) exert powerful influences when investigating this population. In such research, time from stuttering onset is particularly critical to control, in view of present data showing that high percentages of children exhibit spontaneous recovery during the first two years after onset. It should become clear that if CWS are placed in clinical research programs soon after they begin stuttering, they have a good chance of recovering of their own. The shorter the interval from the time of onset, the better is the chance of spontaneous recovery and for the investigator to claim undue credit for the improvement. Yet in some studies, the possibility of spontaneous recovery is not even mentioned. It is quiet clear that control groups receiving no treatment are essential to support the authenticity of therapeutic effects (Curlee & Yairi, 1997).

Subramanian, Yairi, and Amir (2003) found slight differences in second formant transitions in the speech of the two groups.

Much of what is currently known about predictors of persistence and recovery in young children who have been diagnosed with stuttering at an early age (under the age of 6) is summarized in Yairi and Ambrose (2005). Their data reflect analysis of behaviors seen in 70 recovered and 19 persistent children identified shortly after stuttering onset. The first of these is gender. While 84% of young girls recovered, only 77% of the boys recovered. Additionally, girls tended to recover almost six months earlier (post on-set age) than did boys. The second of these was age at onset of symptoms. Recovered children were an

average of 32.6 months of age at onset, while persistent children were somewhat older, 36 months of age. However, these children also had been stuttering somewhat longer (an average of 7 months, as opposed to 4 months). Family history of persistence and recovery also related to eventual outcomes: children who had close relatives who were persistent stutterers were more likely to follow this pattern. Although group averages for language abilities showed both persistence and recovered children to have average to above average language abilities, children who recovered scored higher on both the expressive and receptive portions of preschool language scale. A surprising "non- contender" for predicting outcome was the pattern of stuttering when first referred to the study. Although the two groups obviously diverged over time in the frequency of stuttering behaviors, little distinguished their stuttering profiles were at first evaluation. It is possible that subtle articulatory differerences can differentiate persistent and recovered children close to onset.

4. Need for early identification of stuttering:

Stuttering has serious impact on the individual's personal (self-esteem), psychological, social, vocational and interpersonal relations. There are some risk factors suggested in the literature for predicting recovery or to make decisions regarding intervention such as the presence of family history, chronicity and severity of the problem, associated phonological and language delays or defects, consistency of the problem, child's and/or parental concern etc. However, early identification and treating children close to onset of stuttering is increasingly emphasized by many authors for the following reasons:

(1) It is easy, less time consuming and more long lasting (i.e., approximately 1-3 months or 20 hours for children, to one to several months/years or 140 hours for adults.

(2) Reported rates of success is higher (>90%) compared to that for adults (50-75%) (Starkweather, Gottwald, & Halfond, 1990)

(3) Relapsed rates for treated adults are reported to be around 50% (Franken, 1988); whereas for children it is close to zero. Adults who are treated are reported to have carefully monitored speech (Boberg & Kully, 1994) and diminished quality of speech

or may have residual stuttering behaviors while the treated children are reported to be no different from their non-stuttering peers.

(4) Although it is reported that many children with stuttering spontaneously recover, nearly 20% would continue to stutter if not treated and it is not a small number when 1% of the total adult population who continue to stutter if not treated is considered.

(5) The impact of stuttering problem on the young minds to live with it could be quite handicapping emotionally, socially, educationally and vocationally as reported by many persons with stuttering.

The divergent developmental course of stuttering with its two major paths, persistency and spontaneous (unaided) recovery, has been a focus of scientific attention because of its critical theoretical, research and clinical perspectives. Issues concerning factors underlying persistency and recovery and their implications for early intervention have stirred considerable controversy among scientists. In light of the intense interest, the scarcity of direct essential epidemiological data concerning the magnitude of the two paths and the timing of recovery is problematic. Most past studies have used retrospective methodologies. The few longitudinal studies have been severely limited in scope or objective data. Hence more controlled studies from different cultural and linguistic backgrounds are essential to obtain more reliable data regarding the recovery pattern in children and variables contributing for the same.

METHOD

The project was undertaken to study the recovery pattern and variables related to recovery in CWS.

1. **Participants:** The participants for the study were selected from the children registered with the complaint of stuttering at the All India Institute of Speech and Hearing, Mysore. Based on the survey of registers during 2003-2010, 444 children with stuttering falling in the age range of 3-12 years were selected out of the 16259 cases registered. Four hundred and forty eight letters were sent to the parents of children with stuttering out of which 47 letters returned back due to improper addresses. Attempts were made to contact the parents wherever telephone numbers were available. Overall there was very poor response to follow up and a total of 93 CWS who responded for follow up, meeting the selection criteria for the study were included in the final analysis. The inclusion criteria were that they should be in the age range of 3-12 years with a confirmed diagnosis of stuttering and without any serious medical or psychological problems.

2. **Materials:** The following materials were used for collecting the required data for the present project.

   i. Bangalore passage for Kannada reading task
   ii. Rainbow passage
   iii. Fluency test developed by Nagapoornima, (1990) for picture description
   iv. Sony handycam Model no: HDR- TG1E for Video recording
   v. SPSS 16 software for data entry and analysis.
   vi. SSI III (Stuttering Severity Instrument) by Riley (1994) for measuring the severity of stuttering during follow up
   vii. Assessment checklist for speech and language skills by Swapna, Jayaram, Prema and Geetha (2010) to screen children for possible language delays.

A checklist was developed as part of the study which included information regarding the demographic data, family history, stuttering onset, development and other features, previous evaluation and treatment if any, analysis of symptoms to be collected from the case files. The checklist was developed taking into consideration the possible factors contributing to recovery and persistence (see Appendix1). Re-evaluation checklist (see Appendix1I) was also developed which gathered current information of the child during the follow up.

3. **Procedure**: Signed consent was obtained from the child's parents/caregivers informing the purpose of the project and they were ensured about the confidentiality of the recording. Each child was assessed in detail on follow up using the above checklists and tests. Video recording was done during the testing which were transcribed and analyzed to find the dysfluencies. The sample was analyzed and classified into stuttering like dysfluencies and normal dysfluencies. The stuttering like dysfluencies included repetition, prolongation and hard fixations/blocks. Normal dysfluencies included all the other dysfluencies including interjection, revision, pause and others. Severity was calculated for all the tasks separately.

The data for all the participants were entered into the SPSS software version 16 for further analyses with regard to various factors related to CWS who recovered and thaose who persisted.

RESULTS AND DISCUSSION

The present study aimed to investigate the nature of recovery in CWS and to identify the factors contributing to recovery. The results are discussed under the following heads:

1. **Demographic and other variables:** The nature of disfluencies in CWS in the study was analyzed with respect to the age, gender, age of onset, nature of onset, chronicity, stuttering variability, family history and associated problems. The details are provided in tables 1 & 2.

Table 1: Frequency and % of CWS across different variables

Variables	Age (years)		Gender		Age of onset			Onset	
	3-6	6.1-12	M	F	<3	3.1-5	5.1-12	Sudden	Gradual
Fq	38	55	72	21	34	41	18	26	66
%	(41)	(59)	(77)	(23)	(37)	(44)	(19)	(29)	(71)

Table 2: Frequency and % of CWS across different variables

Variables	Chronicity (months)		Variability		Family history		Associated problems		
	< 6	> 6	Yes	No	Positive	Negative	Nil	Articulation	Language
Frequency	28	65	64	29	33	60	68	12	13
%	30	70	69	31	35	65	73	13	14

   a. ***Age and Gender***: Two age groups were considered in the present study to see whether recovery is better in the younger group compared to the older one as reported by many authors. Among the 93 CWS, 38 (41%) were in the 3-6 years age group and 55 (59%) were in the higher age group (6.1-12 years). Considering the gender, 72 (77%) were boys and 21 (23%) were girls showing almost 4:1 ratio which is as reported in the literature. The findings are supported by Andrews et al. (1983) who reported that males tend to stutter 5 to 10 times greater than females.

   b. ***Age of onset****:* It can be seen from the table that 34 CWS (37%) reported onset of stuttering below 3 years of age and 41 children (44%) between 3.1-5 years. Only 18 CWS (19%) had onsets of stuttering later than 5 years of age. Thus, majority of CWS (81%) had ages of onset before the age of 5 years. The results are in support of the findings by

many of the authors (Darley, 1955; Johnson & Associates, 1959) that the onset of stuttering is most often between the ages of two and five years.

c. ***Nature of onset:*** The nature of onset was classified into two groups - sudden and gradual. Onset of stuttering within a period of 1 week was classified as sudden onset and onsets greater than this as gradual onsets. This classification was taken as per the study by Yairi and Ambrose (1992). It was found that gradual onset of stuttering was reported by 66 (71%) of the CWS. 26 CWS (29%) had sudden onset of stuttering. This is in agreement with Van Riper's (1982) report that the onset of stuttering is usually gradual in nature. He also reported considerably greater than 1% occurrence of stuttering having sudden onset due to brain injury. However, the probable cause for sudden onset was not reported in the present study.

d. **Chronicity of stuttering:** Chronicity of stuttering was considered with respect to a total duration of stuttering since onset, as two groups, consisting of those with less than 6 months and greater than 6 months. A total of 28 (30%) CWS had chronicity of less than 6 months and 65 (70%) had chronicity of greater than 6 months. Thus, the majority of CWS considered in the study had more chronic stuttering. Starkweather (1987) opined that if a child begins stuttering at a young age and the problem persists into five and one half to six (one half year range) there is a good chance that it will become a chronic disorder.

e. **Variability of stuttering:** The variability of stuttering is described across situations, languages and persons. Situational variability included the variability of stuttering across different conditions such as excitement, anger etc. Language variability was variability of stuttering with respect to different languages the child spoke. Variability across persons was variability in stuttering across different persons such as teachers, strangers, friends etc. It was found that 64 (69%) of CWS were reported to have variability in their stuttering while 29 (31%) had no variability as reported by their parents. A high degree of intra speaker variability has been reported by Bloodstein (1987) who also states that due to great variability across different conditions the assessment results may not be representative. Hence, he suggested that the assessment of stuttering behaviors must be conducted in a variety of speaking situations.

f. **Family history:** Among the 93 CWS in the present study, 33 (35%) had positive while 60 (65%) had negative family history of stuttering. Bloodstein's (1995) review indicated the percentage of persons who have relatives who stuttered ranged from 30% to 69%. The results of the present study support the literature indicating a genetic component in selected group of CWS.

g. **Associated problems:** It is reported in the literature that CWS have greater tendency to also have other concomitant speech and language problems compared to normal population. In the present study out of the 93 CWS, 68 (73%) did not exhibit any associated speech and language disorders. In the remaining 27% of CWS, 12 (13%) had articulation problems and 13 (14%) had language problems. The study is in concurrence with previous studies which concluded that 30-40% of CWS achieve lower scores on measures of receptive and expressive vocabulary (Peters & Guitar, 1991) and also on phonological abilities (Yairi & Ambrose, 1999).

h. **Severity of stuttering:** SSI 3 was used to determine the severity of stuttering. A few children (4%) brought by parents with a complaint of dysfluencies were diagnosed as subclinical group. During the initial evaluation majority of CWS had exhibited mild to moderate severity (33% each), followed by very mild (15%), severe (13%) and very severe (1%).

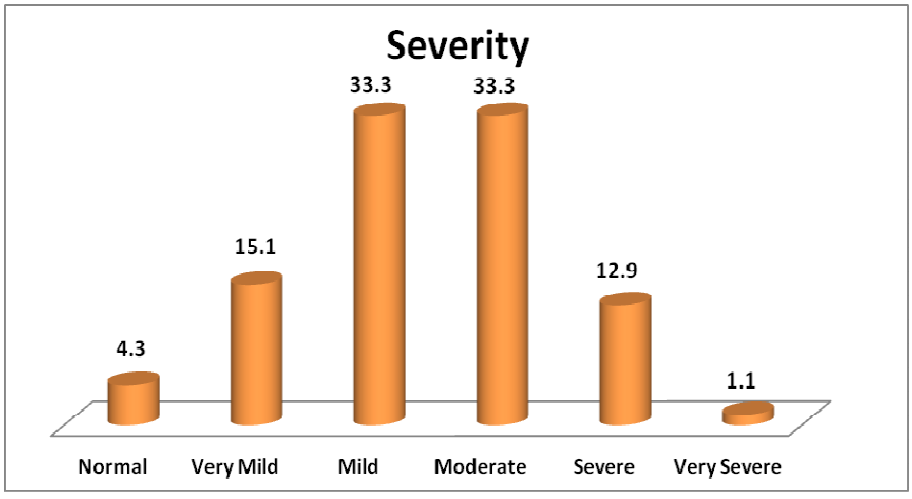

Figure 1: Pre-severity ratings of CWS

The results suggest greater concentration of severity among the mild to moderate group. Conture (1990) described the sequence of development of stuttering for some CWS to range from milder to severe form of dysfluencies. It is known that a gradual increase in awareness and struggle will also lead to increased severity with development.

2. **Variables related to therapy:** Details of duration of therapy are mentioned below in figure 2. As noted majority of CWS attended therapy for a duration of 1 to 4 weeks.

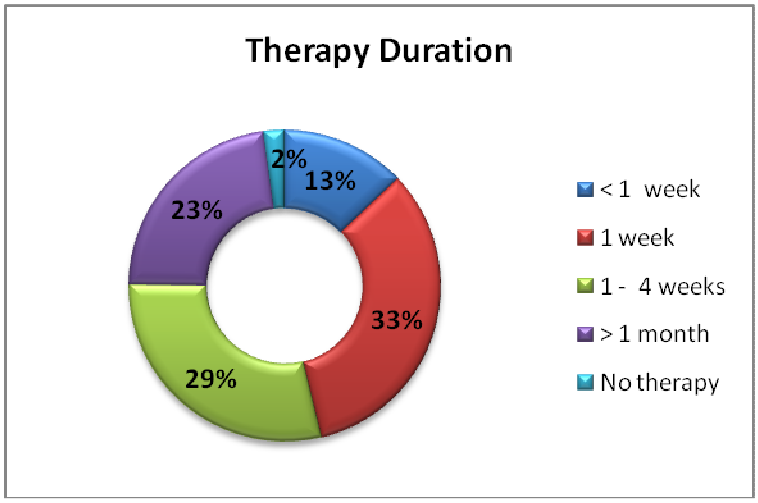

Figure 2: Duration of therapy attended by CWS

a) ***Total duration of therapy attended:*** Out of the total 93 CWS, 91 had attended therapy for various durations from one week to more than a month. 43 (47%) CWS attended therapy for 1 week, 27 (30%) attended therapy for about 1month, 21 (23%) had therapy for more than a month.

b) ***Type of therapy:*** Analogies were the most commonly taught techniques to teach prolongation, slow rate, and gentle onset of speech.

3. **Variables related to recovery:** A decision of recovery was made by comparing pre and current SSI scores. On the basis of this, the nature of recovery was classified into four categories, namely, complete recovery, partial recovery, no recovery and deterioration. The results obtained are described under each group. Table 3 and figure 2 provide details with regard to these recovery groups.

Table 3: Frequency and % of CWS across recovery groups

Type of recovery	Frequency	Percentage
Complete	8	9
Partial	33	35
No recovery	35	38
Worsened	17	18
Total	93	100

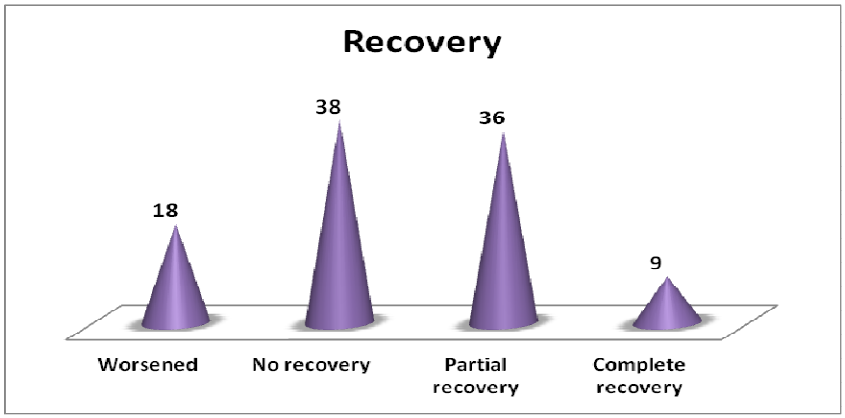

Figure 3: Percentage of CWS under different recovery groups

Table 4: Frequency and % of CWS across pre and post severity groups

Severity groups	Pre Frequency (%)	Post Frequency (%)
Sub-clinical	4 (5)	9 (10)
V. mild	14 (15)	16 (17)
Mild	31 (33)	41 (44)
Moderate	31 (33)	19 (20)
Severe	12 (13)	8 (9)
V. severe	1 (1)	0 (0)
Total	93 (100)	93 (100)

a) ***Complete recovery:*** The category of complete recovery included those CWS who reported to have maintained the improvement and whose current overall SSI scores were below 10 having less than 5 percentile in SSI-3 (Riley, 1994). This criterion was taken following the study by Coulter, Anderson and Conture (2009), wherein the authors classified participants as children with no stuttering (CWNS) if they obtained a total overall score of 10 or below (severity rating within very mild) on the SSI-3. The pre-severity levels of stuttering were

mild in 4 CWS (57.1%) and moderate in 3 CWS (42.8%). During the follow up evaluation complete recovery was observed.

b) **Partial recovery:** The category of partial recovery included those CWS who showed improvement based on their current SSI scores but not to the complete extent. That is, their current SSI scores were less than the pre-therapy SSI scores. Also, the current scores on the SSI-3 should be greater than the 5th percentile. During the follow up evaluation 36% of children exhibited partial recovery.

c) **No recovery:** CWS were classified as having no recovery or completely relapsed, if their current SSI scores were the same as the pre-therapy SSI scores. In the present study, 35 (38%) CWS exhibited no recovery compared to their pre-therapy condition.

d) **Worsened:** CWS were classified as worsened if their current SSI scores were greater than the pre-therapy SSI scores. Totally 17 (18%) CWS exhibited worsening of their stuttering during follow up evaluation.

To summarize, the number of children followed up for the present study included 444 CWS. Out of which only 93 reported during follow up evaluation. Details about remaining 325 CWS is not known. Possibly majority of them might have recovered completely or to various extents and hence did not report for follow up. However, it is difficult to conclude without testing fluency among the unreported children. Among the 93 CWS who reported a total recovery (complete and partial) was found in 45% of CWS. While in remaining 55% there was no recovery or the condition worsened. Probably this group also consisted of children with chronic condition of stuttering. Hence, it suggests that children with chronic condition may not improve to a great extent with therapy limited to few days.

The recovery patterns observed in the groups of CWS are discussed under different headings. Table 5 depicts pattern of recovery across different variables considered in the study.

1. Age: Two age groups were considered in the present study to see whether recovery is better in the younger group compared to the older one as reported by many authors. Among the lower group (3-6 years), 3 (8%) CWS showed complete recovery, 15 (39%) partially recovery, 14 (37%) showed no recovery and 6 (16%) worsened. In the higher age

group (6.1-12 years), 5 (8%) showed complete recovery, 18 (33%) partially recovery, 20 (39%) showed no recovery and 11(20%) worsened.

Table 5: Percentage of CWS in various recovery groups across different variables

Variables	Category	Percentage Of Recovery Status				Chi-square Value
		Worsened	No recovery	Partial	Complete	
Associated problems	Nil	18	38	34	10	0.058
	Articulation	25	50	25	0	
	Others	15	23	54	8	
History	Negative	22	35	37	7	0.537
	Positive	12	42	33	12	
Onset	Sudden	22	44	19	15	0.134
	Gradual	17	35	42	6	
Chronicity	< 6 months	25	36	25	14	0.287
	> 6 months	15	38	40	6	
Variation	No	28	31	28	14	0.208
	Yes	14	41	39	6	
Duration of therapy	< 1 week	17	25	50	8	0.147
	1 week	32	29	32	6	
	1 - 4 weeks	11	52	30	7	
	> 1 month	05	43	43	10	
	No therapy	50	0	0	50	
Age group	3-6 years	16	37	39	8	0.999
	6.1-12 years	20	38	33	9	
Gender	Male	19	39	38	4	0.045
	Female	14	33	29	24	
Onset age	< 3 years	21	38	32	09	0.127
	3.1-5 years	15	46	27	12	
	5.1-12 years	22	17	61	0	
Severity	Very mild	56	33	0	11	0.000
	Mild	19	48	23	10	
	Moderate	3	29	58	10	
	Severe	0	42	58	0	
	Very severe	0	0	100	0	

Table 4 depicts the recovery pattern across the two age groups. The results suggest that majority of the children belonging to lower age group (47%) recovered slightly better compared to higher age group. Considering the aspect of no recovery and worsened conditions, majority of the children belonged to the higher age group. This is in agreement with the findings by many authors (Conture, 1990; Fosnot, 1993; Onslow, 1992), who

reported that younger the person, the better are the chances of recovery. Stuttering is reported to show spontaneous recovery in majority of children soon after its onset and younger children are expected to show better recovery with treatment than older children and adults. However, our results were not statistically significant. Chi Square analysis revealed no association ($\chi 2$ (6) = 2.217, $p > 0.05$) across lower and higher age groups towards recovery pattern. The results suggest that the age of CWS may not be a major contributing factor towards recovery pattern.

2. Gender: Among the total of 72 boys, 3 (4%) showed complete recovery, 27 (38%) partially recovered, 28 (39%) showed no recovery and 14 (19%) worsened. While among the total of 21 girls, 5 (24%) showed complete recovery, 6 (29%) partially recovered, 7 (33%) showed no recovery and 3 (14%) worsened.

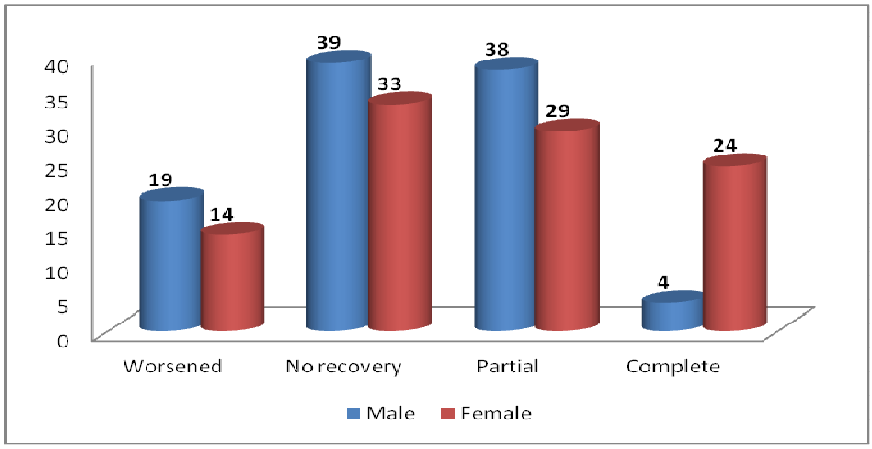

Figure 4: Recovery pattern across gender

Figure 4 depicts the recovery pattern across the gender groups. Majority of the girls (53%) recovered significantly compared to boys. Considering the recovery pattern across gender, a significant difference was found. Chi Square analysis indicated a significant association ($\chi 2$ (3) = 8.028, $p < 0.05$) across gender towards recovery pattern. Cramer's value measure indicated 29% association with respect to gender in terms of recovery pattern. The results suggest that gender of CWS may be a major contributing factor towards recovery pattern with more positive results noticed for girls. This study is in accordance with literature findings. It is reported that girls begin stuttering earlier and recover earlier than boys (Starkweather, 2002).

Yairi and Ambrose (2005) reported that 84% of young girls and 77% of the boys recovered. Additionally, they also reported that girls tended to recover almost six months earlier (post onset age) than did boys. Hence, the results are in accordance with literature suggesting gender of CWS as a major contributing factor towards recovery.

3. Age of onset: The three categories of age of onset of stuttering considered were below 3 years, 3.1-5 years and 5.1- 12 years. It can be seen from the table that among the 34 children with lesser than 3 years age of onset, 3 (9%) showed complete recovery, 11 (32%) had partial recovery, 13 (38%) showed no recovery and 7 (21%) worsened. Among the second group i. e, age of onset between 3.1-5 years, 5 (12%) showed complete recovery, 11 (27%) had partial recovery, 19 (46%) showed no recovery and 6 (15%) worsened. Among the third group with later age of onset i.e., 5.1-12 years, none showed complete recovery, 11 (61%) had partial recovery, 3 (17%) showed no recovery and 4 (22%) worsened. Higher proportion of children who completely recovered belonged to the age of onset within 5 years of age. However, majority of children (61%) with age of onset 5.1-12 years had partially recovered. This indicates that recovery exists across age of onset to various extents. The results of the present study were not statistically significant. Chi Square analysis revealed no association ($\chi 2$ (6) = 9.939, $p > 0.05$) across age of onset towards recovery pattern. Hence, it suggests that the age of onset of CWS may not be a major contributing factor towards recovery pattern.

4. Nature of onset: The nature of onset was classified into two groups, sudden and gradual. Among the 27 CWS with sudden onset, 4 (15%) showed complete recovery, 5 (19%) had partial recovery, 12 (44%) showed no recovery and 6 (22%) had worsened. Among 66 CWS with gradual onset, 4 (6%) showed complete recovery, 28 (42%) had partial recovery, 23 (35%) showed no recovery and 11 (17%) worsened. Majority of the children (48%) with gradual onset recovered compared to sudden onset. The probable reason for this could be that the cause for gradual onset is mostly developmental whereas in case of sudden onset neurological or psychological causes may exist. Bloodstein (1995) termed stuttering as a disorder of childhood that mostly develop slowly. The results of the present study however, were not statistically significant. Chi Square analysis revealed no association ($\chi 2$ (3) = 5.585,

$p > 0.05$) across nature of onset towards recovery pattern. Hence, it suggests that the nature of onset of CWS may not be a major contributing factor towards recovery pattern.

5. Chronicity of stuttering: Among a total of 28 CWS with less than 6 months duration since onset, 4 (15%) showed complete recovery, 7 (25%) partially recovered, 10 (35%) showed no recovery and 7 (25%) worsened. Among the 65 CWS with more than 6 months duration since onset, 4 (7%) showed complete recovery, 26 (40%) partially recovered, 25 (38%) showed no recovery and 10 (15%) worsened. Almost equal percentage (40% to 47%) of children recovered across chronicity of less and greater than 6 months. The results of the present study with regard to chronicity were not statistically significant. Chi Square analysis revealed no association ($\chi 2$ (3) = 3.774, $p > 0.05$) across chronicity of stuttering towards recovery pattern. Hence, it suggests that it may not be a major contributing factor towards recovery pattern. Though the results are not significant, the data suggest that children who had stuttering for less than 6 months exhibited slightly better recovery of stuttering compared to more than 6 months. The results are in agreement with the findings of Yairi and Ambrose (1992). Their results indicated that for the two subgroups (with and without intervention) there was a marked deceleration over time in the mean frequency of stuttering-like disfluency. They also reported indications that group differences between chronic and recovering CWS become distinct by approximately 20 months post-onset. In the year 2005, in their analysis of behaviors seen in 70 recovered and 19 persistent children identified shortly after stuttering onset, they noted that the recovered children were on an average of 32.6 months of age at onset, while persistent children were somewhat older, i.e., 36 months of age. However, these children had also been stuttering somewhat longer (an average of 7 months, as opposed to 4 months). The results of the present study are in agreement with earlier studies, i.e., longer duration of persistence of stuttering could result in limited recovery. This evidence clearly indicates the importance of obtaining accurate information about the timing and circumstances pertaining to the onset of disfluency. It will facilitate the identification of children who are likely to need early intervention in order to avoid the development of a chronic problem.

6. Variability of stuttering: The presence of variability of stuttering among 64 CWS showed 4 (6%) with complete recovery, 25 (39%) partial recovery, 26 (41%) with no recovery and 9

(14%) worsened. Among 29 CWS with absence of variability of stuttering 4 (13%) showed complete recovery, 8 (28%) partially recovered, 9 (31%) no recovery and 8 (28%) worsened. Almost equal percentage (41% to 45%) of children recovered across variability of stuttering. The results of the present study with regard to variability were not statistically significant. Chi Square analysis revealed no association ($\chi 2$ (3) = 3.774, $p > 0.05$) across variability of stuttering towards recovery pattern. From the results it can be understood that variability may not be a major contributing factor towards recovery pattern.

7. Family history: Among a total 33 CWS with positive family history of stuttering, 4 (13%) showed complete recovery, 11 (33%) partial recovery, 14 (42%) no recovery and 4 (12%) worsened. Out of 60 (65%) with negative family history of stuttering 4 (6%) showed complete recovery, 22 (37%) partial recovery, 21 (35%) no recovery and 13 (22%) had worsened. Almost equal percentage (43% to 46%) of children recovered with and without family history. Though the results are not significant, the data suggest that the children with negative family history exhibited better recovery. The present study is in consensus with Sheehan and Martyn (1966). They concluded that no familial incidence pattern was found with spontaneously recovered PWS when compared to active PWS and the normal control group. Cooper (1972) also found familial incidence of stuttering to be negatively related to recovery from stuttering. The results also suggest that the children with positive family history exhibited recovery, which is surprising considering the research findings in the area. This is in consensus with Yairi and Ambrose (2005). Family history of persistence and recovery was the eventual outcome in which children who had close relatives who were persistent PWS were more persistent than the others. Children who recover from stuttering without receiving intervention tend to have more relatives who also recovered than do children who continue to stutter (Curlee & Yairi, 1997). Also, it has been assumed that family history pattern may also predict whether children who do not recover either show persistency following treatment or exhibit stuttering which is resistant to therapy (Yairi, 1997). In the present study information about recovery pattern in the family (in case of positive family history) was not taken from parents. However, there is no conclusive evidence of a relationship between the family history and recovery pattern. The results of the present study with regard to family history were not statistically significant. Chi Square

analysis revealed no association ($\chi 2$ (3) = 2.176, $p > 0.05$) across family history towards recovery pattern. From the results it can be understood that family history may not be a major contributing factor towards recovery pattern.

8. Associated problems: Among a total 68 CWS with no associated problems, 7 (10%) showed complete recovery, 23 (34%) partial recovery, 26 (38%) showed no recovery and 12 (18%) had worsened. In a total of 12 CWS who had articulation problems 3 (25%) showed partial recovery, 6 (50%) showed no recovery and 3 (25%) worsened while in a total of 13 CWS who had language problems, 1 (8%) showed complete recovery, 7 (54%) partial recovery, 3 (23%) showed no recovery and 2 (15%) had worsened. The results suggested majority of CWS with no associated problems to recover compared to CWS who had articulation problems. Although few recent studies and reviews of the pertinent literature (e.g., Nippold, 1990; Wolk, Edwards & Conture, 1993) have shown that there is relatively a high prevalence of phonological delay or language disorders in CWS, very few studies have discussed its association with recovery or persistence. One study by Paden, Yairi, and Ambrose (1999) reported poorer performance on all aspects of phonological abilities in preschool children who had persistent stuttering. The presence of coexisting articulation problems might exceed the demand to speak fluently. Surprisingly, it was observed that CWS who had language problems had also recovered to a great extent (62%). The probable reason for this could be that in a group of CWS with language problems most of children had only learning disability and hence could manage well with therapy. Conture et al. (1993) and Bernstein Ratner (1995) described the clinical observation that children who stutter and exhibit coexisting phonological problems sometimes make little or no progress in therapy, or take longer to show improvements in speech fluency over the course of treatment. The present findings are in agreement with literature with respect to less recovery in CWS having associated problems, though not significant. It is suggested that children with associated problems require intensive treatment and focused strategies for dealing with stuttering and coexisting conditions. Chi Square analysis revealed no association ($\chi 2$ (3) = 16.438, $p > 0.05$) across associated problems towards recovery pattern. From the results it can be understood that associated problems may not be a major contributing factor towards recovery pattern.

9. Severity of disfluencies: Majority of the children belonged to very mild (2, 11%) followed by mild (3, 10%) and moderate severity (3, 10%) in the completely recovered group. Among the partially recovered group majority of the children were from mild severity (7, 23%) followed by moderate (18, 58%) and severe (18, 58%). No recovery group also included CWS with various degrees of severity. It was also noted that the group of children who had worsened included 10 (66%) CWS with very mild severity. The reasons for this could be that during initial assessment, these children exhibited severity of stuttering in its milder form which developed and became chronic. Hence, during the follow up evaluation it was found that the condition had worsened. Chi Square analysis revealed significant association ($\chi 2$ (12) = 38.568, $p < 0.05$) across severity and recovery. Logistic regression analysis was also employed to examine the multiple variables contributing towards recovery pattern. It was found that only severity was a predicting factor to suggest recovery pattern. From the results it can be understood that severity is a major contributing factor towards recovery pattern.

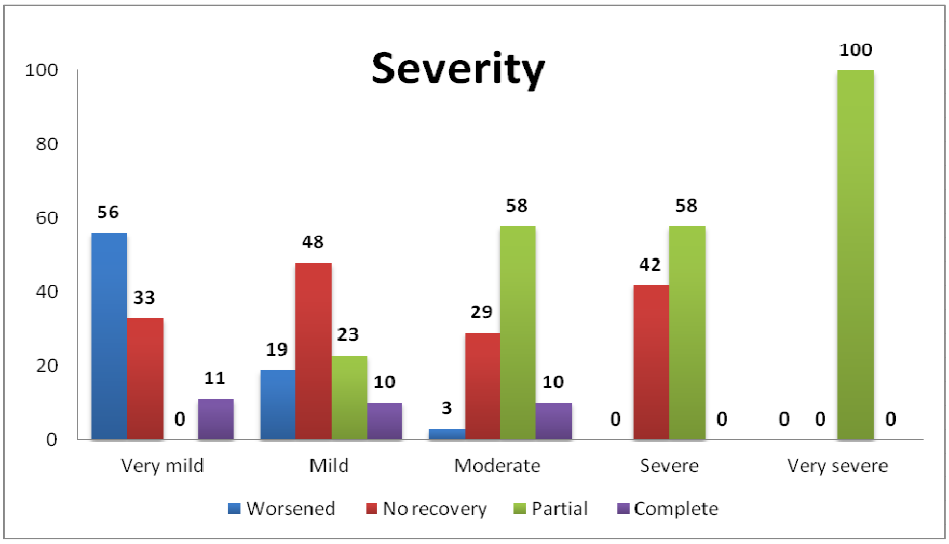

Figure 5: Pre and post ratings across the severity groups in CWS

The present study results are in consensus with Ladouceur, Caron, and Caron (1989). Their results showed that all mild and most moderate PWS clinically improved at the end of treatment and at six months follow-up. No severe PWS (more than 15% of syllables stuttered) achieved clinical improvement. Howell and Davis (2011) study also supports the

results of the present study to some extent. They analyzed risk factors such as head injury, age at stuttering onset, family history of stuttering, handedness, use of second language, gender, and scores from the SSI-3. They concluded that the only factor to predict the persistence of, and recovery from, stuttering at the teenage years was stuttering severity at around 8 years with sensitivity and specificity of ~80% (none of the other factors being significant). Hence the studies emphasize on the importance of considering information on degree of severity during interview and further training.

10. Therapy and Recovery: On comparing the group of children who did not attend therapy (2), 1 (50%) showed complete recovery and 1(50%) showed no recovery. Among 91 children who attended therapy 7 (8%) showed complete recovery, 23 (36%) partial recovery, 35 (38%) showed no recovery and 16 (17%) had worsened. Chi Square analysis revealed no association ($\chi 2$ (12) = 17.077, $p > 0.05$) across the duration of therapy and recovery pattern. From the results it can be understood that duration of therapy (1 week to more than month) may not be a major contributing factor towards recovery pattern. Though the results are not significant, the data suggest that children who attended therapy exhibited recovery in 44% of CWS.

Stuttering can be resolved using various treatment procedures. Researchers claim varied range of improvement by using different techniques. It is reported that stuttering therapy is better than no therapy. The duration of sessions attended by CWS ranged from 3-25 sessions, which was not really adequate to show improvement. It was observed that longer duration of therapy sessions (more than a month) yielded better improvement. It is reported to be easy, less time consuming and more long lasting (i.e., approximately 1-3 months or 20 hours for CWS compared to adults (Starkweather & Gottwald,1986). Prins (1970) suggested intensive treatment to show rapid change in an individual. In the present study it was observed that most of the children were persistent with stuttering. The probable reason for this condition could be that they attended for shorter duration, irregularity in attending sessions, poor maintenance, home training and follow up.

In the present study another issue with regard to children who did not attend therapy was that out of 2 CWS one child (50%) had recovered and another child had persistent

stuttering. It suggests that one child might have had spontaneous recovery. Literature reports that in a relatively large proportion of young children, within the first year of onset, spontaneous recovery would occur and is a serious complication for treatment efficacy studies with children (Bloodstein, 1995; Yairi & Ambrose, 1992a). It is difficult to be definitive about the proportion of children who will recover without therapy as the research reports wide variations. Andrews et al (1983) reported recovery rates from 23 to 80% when they reviewed research from all available studies. This undermines confidence of the results reported by treatment efficacy studies, as stuttering may disappear irrespective of any treatment received. There is, however, an ethical question that must be addressed. In the study by **Ramig (1993),** the families of 21 children who stuttered were contacted 6 to 8 years after their child first was diagnosed as needing intervention for stuttering. The vast majority of these children were still exhibiting a stuttering problem at the time of reassessment. In consensus with earlier studies, in the present study also it was found that there are 50% chances of CWS to persist with stuttering. Hence there is a need to initiate therapy as soon as the problem is identified. Early intervention for the child who stutters during the preschool and elementary school years is encouraged in order to increase a child's probability of coping with a stuttering problem that may not be resolved on its own.

To summarize the results mentioned above, it was found that with respect to some of the factors such as age, nature and age of onset, chronicity, variability, associated problems, family history and therapy related factors, no significant difference was noted with recovery pattern except gender and severity. However, there were slight variations observed across groups within each factor and are discussed. The results support the viewpoint of stuttering as a dynamic disorder. The multi-factorial nature of stuttering results in heterogeneous group. This may be one reason why some children completely recovered, some partially recovered, some showed no recovery and some worsened. Although, there are some universal features, the development of stuttering often follows a highly individual course. Peo
ple who stutter, just as normals, are far from unique.

SUMMARY AND CONCLUSION

Recovery from stuttering means either reduction or elimination of stuttering and replacement with natural sounding stutter free speech. A complete understanding of individuals who recover from stuttering due to presence and absence of treatment is critical to a complete understanding of the nature of stuttering and its management. There are some risk factors suggested in literature for predicting recovery to make decisions regarding intervention. However, there are no large scale studies in the Indian context with its unique cultural and linguistic environment aiming at understanding the recovery pattern. Hence, the present project aimed to identify the nature of recovery in children with stuttering and to investigate the predicting factors contributing to recovery.

In the present study 444 CWS were followed up and only 93 children reported and underwent follow up evaluation. The criteria for inclusion in the study was that the children should have registered at the institute and diagnosed as having stuttering problem and should be in the age range below 12 years. 93 children reported for a follow up and were included in the study. A checklist was developed and it comprised of questions targeting recovery and the factors contributing to the same. Questions pertaining to the age, gender, age of onset, nature, chronicity, variability, etiology, severity, associated problems and treatment details were included. Such specific information was noted by referring to the case files. Reevaluation checklist was also developed to gather current information about the speech problem. During the follow up visit, all CWS were reevaluated using SSI 3 and reevaluation checklist. Video recording was made during the assessment. The recorded samples were transcribed and analyzed to find the dysfluencies. The data was then subjected to statistical procedures such as chi square and regression analysis and group-wise comparison across different variables contributing to recovery.

The results of the current study revealed that majority of the children experienced relapse in stuttering and deterioration in fluency. Among the 93 CWS who reported, recovery (complete and partial) was found in 45% of CWS. While in the remaining 55% there was no recovery or the condition worsened in some. Majority of the children belonging to lower age group, age of onset within 5 years of age, female CWS, those with gradual nature of onset, chronicity less than

6 months, absence of associated problems recovered better compared to other groups although group differences were not significant. Almost equal percentage of children recovered across variability of stuttering and family history. Among the children who attended therapy 44% of CWS exhibited recovery. The results suggest none of the above mentioned factors showed significant association towards recovery pattern except gender. Considering therapy as a factor, it is also important to incorporate attitude, behavior modification and emotional support into the treatment regimen of CWS. Also, it is important to devise better means of training during the maintenance phase of therapy, so that the relapse rates reduce. In case of CWS, better treatment methodology and techniques incorporating both direct and indirect intervention principles would yield better results. Counseling the immediate members in the child's environment will also be helpful in achieving the goal.

The only significant predicting factor towards recovery pattern was found to be the severity of stuttering on regression analysis, apart from the gender. Majority of children belonged to very mild and moderate severity in the completely recovered group and among the partially recovered group majority of children were from mild, moderate and severe group. Hence, the results suggest emphasizing on the importance of considering information on degree of severity during interview and further training.

To summarize, the study implies that the knowledge of the predictive factors would provide insight into the recovery pattern. The results support the viewpoint of considering stuttering as a dynamic disorder. The multi-factorial nature of stuttering results in a heterogeneity among the group. This may be one reason why some children completely recovered, some partially recovered, some showed no recovery and some worsened. Although, there are some universal features, the development of stuttering often follows a highly individual course. People who stutter, just as normals do, are far from unique.

Clinical implications of the study

- To understand the proportion of CWS exhibiting various recovery patterns
- To understand the nature of predictive factors contributing to recovery in CWS
- To enhance the research knowledge on the recovery pattern in CWS in the Indian context

Limitations of the study

- Considering the multi-factorial nature of stuttering all the factors could not be controlled
- Number of CWS were limited to draw major conclusions
- Therapy details could not be controlled with regard to type of therapy, duration and follow up data

Future Directions:

- A similar study may be carried out with a large data and on a longitudinal basis
- A study can be carried out in search of any other variables contributing to recovery and persistence in stuttering
- Research on treatment variables related to recovery patterns in CWS and AWS

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Appendix I
Pattern of recovery in children with stuttering-ARF Project Checklist

I. General Information Date:

Informant: Parents/Relatives (specify) Phone number:

Address: mail:

A. Child Information

a. Case name: b. Case number: c. Age/ Sex:

d. Current living environment: Rural/Semi-urban/Urban;

e. Mother tongue: Other languages:

f. Education: preschool/LKG/UKG/1st standard /2nd standard

g. Developmental history: Nil/motor/Sensory/Speech & Language (specify)

h. Associated problems: Nil/Articulation/Language/HI/LD/MR/Others (specify)

B. Parental Information

a. Age range in years: 20-30/30-40/40-50/50-60

b. Education- b1- Father: Illiterate/School level/PUC/G/PG/Professional

b2- Mother: Illiterate/School level/PUC/G/PG/Professional

c. Occupation: c1.Father:NA/Nil/Unskilled/Semiskilled/Skilled/Semi-prof/Professional

c2. Mother:NA/Nil/Unskilled/Semiskilled/Skilled/Semi-Prof/Professional

d. Family Status: Nuclear/Joint/Extended

p. Total number of persons in the family: < 3/ 4-6/ 7-8/ > 8

q. Total family income: Slab I / Slab II / Slab 3

II. Brief family history

a. Family: Nuclear/Joint

b. Consanguinity: -ve /+ve (I degree/II degree/III degree)

c. Family history of associated problems: Nil/affected (specify)

III. Stuttering onset, development and other features

a. Onset: Sudden/Gradual;

b. Duration: <1 month/1- 3 months/3- 6 months/6- 12 months/> 1 year

c. Progression: reduced/remain the same/fluctuating/ increased

d. Family history: No/Yes (specify): Parent/Sibling/grant parents/uncle/aunt /others

e. History of contact with stutterer: No /Yes; If yes,

e1. Relation-Parents/ Grant Parents/Siblings
e2. Duration- rarely /frequently
e3. Period- from birth/1 year/ 2 years/ 3 years/ 4 years/ 5 years/ 6 years

f. Awareness:

f1. Parents- Not aware/highly aware
f2. Child: Not aware /highly aware
f3. Parents - not concerned /concerned/ highly concerned
f4. Child - not concerned /concerned/highly concerned

g. Variation in stuttering**:**

g1. Situation: small group/big group/school/play group

g2. Individuals: teachers/strangers/friends/parents/siblings

g3. Languages: mother tongue/other languages (specify)

h. Stuttering anticipated: No/Yes (specify)

i. Stuttering is avoided- No/Yes (specify)

j. Coping mechanism used:

j1. As reported: Avoided/postponed/use alternate words/others

j2. As observed: Avoided/postponed/use alternate words/others

k. Speech mechanism examination:
Structure: Adequate/Inadequate; Function: Adequate/Inadequate

l. Academic information: Below average/average/above average

m. Parents' reactions to child's stuttering: looking away/ speaking for him/interrupting/ punishing

n. Others' reactions to child's stuttering: Looking away/speaking for him/interrupting/ punishing/ making fun

o The child's reactions to his stuttering: negative /not concerned/positive (specify)

p. Have you received any kind of counseling? Nil/Psychological/Academic/others (specify)

IV. Previous evaluation and treatment if any

a. Any previous treatment: No/Yes If yes, (specify type of therapy)
b. Duration of therapy: <1 wk/1wk-1 month />1month

c. Analysis of symptoms

c1. Speech sample: Reading /Narration/Conversation/Spontaneous speech

c2. Type of disfluency: 1.Repetition 2. Prolongation 3.Articulatory fixation/blocks 4. Pauses/ interjection/others (specify)

c3. Frequency of stuttering: 0-5/min; 5-10/min; 10-15/min; >15/min

c4. Duration of stuttering: <1 sec/1-2 sec/ 2-9 sec/ 10-30 sec/ 30-60 sec/ > 60 secs

c5. Rate of speaking: Very slow/slow/Average/Fast/Very fast

c6. SPM:

c7. Diadachokinetic Rate:

c8 Secondaries: Eye blink/Raising eye brows/Nose flaring/Clenching/Tongue thrust/Jerky articulatory movements/Facial grimaces/Abnormal breathing/others (specify)

c9. Anxiety: Nil / Mild / Moderate / Severe

c10. Anxiety features: Sweating /Shivering/Heart thumping/(specify)

c11. Avoidance: Sound fear/Word fear/ Situation fear/Fear of person/Fear of lang.

d. Severity of the problem (as per the scores of SSI):

d1, Freq score-Job task: ☐ /Reading task: ☐ /Picture task: ☐

d2, Secondary behavior: d3, Duration: d4, Physical concomitant:

d5, Total score: ☐ d6, Percentile: ☐

d7. Severity: Very mild/ Mild/ Moderate/ Severe/ Very severe

Evaluation findings:

Follow-up: *Letter sent / called up/e mailed on:*

V. Current assessment

a. What are his/her interests or hobbies?

b. Does the child have playmates? No /Yes; If yes, Younger/older

c. Is there anything else that concerns you about your child? No /Yes; if yes, specify:

d. How would you best describe your child? Shy/sensitive/extroverted/easy going

e. Self concern- highly concerned/concerned/not concerned

f. If concerned, major concern-fluency/academics/anything else

g. Ever fluent? Yes/No; If yes, frequently/sometimes/rarely

h. Does your child play well by him/herself? No/Yes

i. Does he or she have many friends? No/Yes

j. Does the child require much attention? No/Yes

k. Does your child seem more active than children his or her age? No/Yes

l. Does s/he adjust to a new environment/situation? No/Yes

m. Does he or she do what you ask? Complete chores, and so forth? No/Yes

n. Does he or she do anything that particularly annoys you or anyone else? No/Yes

o. Current analysis of symptoms**:**

o1**.** Speech sample: Reading /Narration/Conversation/Spontaneous speech

o2. Type of disfluency**:** 1.Repetition 2. Prolongation 3.Articulatory fixation/blocks 4. Pauses/ interjection/others (specify)

o3. Frequency of stuttering: 0-5/min; 5-10/min; 10-15/min; >15/min

o4. Duration of stuttering: <1 sec/1-2 sec/ 2-9 sec/ 10-30 sec/ 30-60 sec/ > 60 secs

o5. Rate of speaking: Very slow/slow/Average/Fast/Very fast

o6. SPM: o7. Diadachokinetic Rate:

o8 Secondaries: Eye blink/Raising eye brows/Nose flaring/Clenching/Tongue thrust/Jerky articulatory movements/Facial grimaces/Abnormal breathing/others (specify)

o9. Anxiety: Nil / Mild / Moderate / Severe

o10. Anxiety features: Sweating /Shivering/Heart thumping/(specify)

o11. Avoidance: Sound fear/Word fear/ Situation fear/Fear of person/Fear of lang.

p. Severity of the problem (as per the scores of SSI):

p1, Freq score-Job task: /Reading task: /Picture task:

p2, Secondary behavior: p3, Duration: p4, Physical concomitant:

p5, Total score: p6, Percentile:

p7. Severity: Very mild/ Mild/ Moderate/ Severe/ Very severe

Evaluation findings:

SH/ARF 3.54-YVG/2010-11 17.10.2011

Submitted to the Director

Sub: Submission of ARF (No. 3.54/2010-11) Project Report

Ref: SH/Coordn/ARF/3.54/2010-11

With reference to the above, we are herewith submitting the Project Report (ARF/No. 3.54/2010-11) titled "Pattern of Recovery in Children With Stuttering". We express our sincere gratitude for sanctioning and providing all support for carrying out the project.

In this context we are also pleased to inform you that the paper based on part of this project work was presented by the Co-investigator of the project in the 9th Oxford Dysfluency Conference held at Oxford, UK during the first week of September 2011. The title of the paper was "Recovery in children with stuttering", which was received well by the delegates of the conference. The paper is being modified for publication in the Journal of Fluency Disorders, which is going to bring out the conference proceedings.

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